

CHAPTER

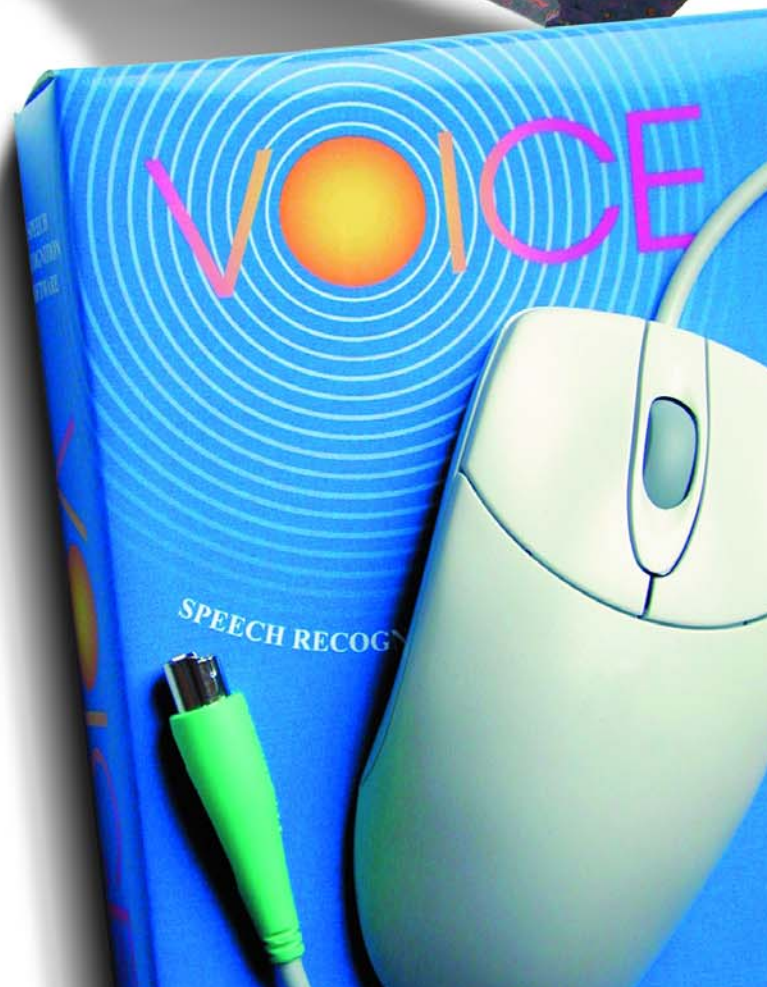
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Input

As the semester ends, schoolwork is becoming more intense. Your term paper on the American Revolution is due next week. The research is complete, but you still need to type and format your document. Written summaries of biology labs also are due. Your partner just e-mailed you the spreadsheet analysis for your marketing case study. You have to write a report that summarizes these findings.

Before sitting down at the computer, you decide to get some fresh air and take your dog, Bandit, for a walk. First thing out the door, Bandit wraps his leash around your legs as he takes off after a cat. Trying to free yourself, you fall down and break your right arm and two fingers. After a lengthy delay in the emergency room, you now have a cast from your shoulder to your fingertips.

You are beside yourself wondering how you are going to finish all your papers. You barely can type and cannot use the mouse at all. Your friend suggests voice recognition software. Just talk to the computer and it writes what you say. This sounds perfect! You spend some of your savings on the software thinking — this is going to be cool!



WHAT IS INPUT?

Input is any data or instructions you enter into the memory of a computer. Users can input data and instructions using a variety of techniques (Figure 5-1). A keyboard allows you to type characters. Using a mouse, you can click a button or roll a wheel to input instructions to the computer. A microphone allows

you to speak into the computer. You can write on some computer screens with a special writing device. With others, you touch the screen to make selections. You can send images into the computer using a digital camera, video camera, or a scanner.

Once input is in memory, the processor can access it and process it into output. As mentioned, two types of input are data and instructions (Figure 5-2).

OBJECTIVES

After completing this chapter, you will be able to:

- Describe the two types of input
- List the characteristics of a keyboard
- Identify various types of keyboards
- Identify various types of pointing devices
- Explain how a mouse works
- Describe different mouse types
- Explain how voice recognition works
- Understand how to input data into a handheld computer
- Identify the uses of a digital camera
- Describe the various techniques used for video input
- Describe the uses of PC video cameras and Web cams
- Explain how scanners and other reading devices work
- Identify alternative input devices for physically challenged users



Figure 5-1 Data can be input into a computer in a variety of ways.

Data is a collection of raw unprocessed facts, figures, and symbols. In addition to words and numbers, data also includes sounds, images, and video. Technically speaking, a datum is a single item of data. The term data, however, commonly is used and accepted as both the singular and plural form of the word.

A computer processes data into information. **Information** is data that is organized, meaningful, and useful to a particular user or group of users. The timecards for a given week are an example of data. A company might process this data into a report (information) that summarizes the total hours worked and the payroll expense for the week.

Instructions can be in the form of programs, commands, and user responses. Following is a description of each type of instruction.

A **program** is a series of instructions that tells a computer how to perform the tasks necessary to process data into information. Programs are kept on storage media such as a floppy disk, hard disk, CD-ROM, or DVD-ROM. Programs are input into the memory of the computer, as they are needed. Programs respond to commands that a user issues.

A **command** is an instruction given to a computer program. Users can issue commands by typing or pressing keys on the keyboard, clicking a mouse button, speaking into a microphone, or touching an area of a screen.

Most programs today are menu driven and have a graphical user interface. A **menu-driven** program provides menus as a means of entering commands. Menus contain a list of options from which you select.

A **graphical user interface (GUI)** has icons, buttons, and other graphical objects that allow you to select and issue commands. A GUI is the most user-friendly way to interact with a computer.

A **user response** is an instruction you issue by replying to a question that a computer program displays. Your response to the question instructs the program to perform certain actions. Assume the program asks the question, Are the timecard entries correct? If you answer Yes, the program saves the timecard entries on a storage device. If you answer No, the program gives you the opportunity to modify the entries.



Figure 5-2 Two types of input are data and instructions. Instructions can be in the form of user responses, commands, and programs.

ISSUE

Watching Your Emotions

Emotional Input and Your Privacy

In addition to data, programs, commands, and user responses, researchers are experimenting with a fifth type of input – human emotions. A development called affective computing uses input devices such as video cameras and skin sensors with software similar to voice recognition programs, allowing a computer to read a user's emotions. For example, a furrowed brow and sweaty palms might indicate frustration. Emotional input could be invaluable in conjunction with computer-aided instruction, letting a computer know whether to speed up or slow down tutorials. Some people, however, see affective computing as an invasion of privacy. Do you agree? In what areas might affective computing be useful? Why? Would you be comfortable with a computer knowing how you feel? Why or why not?

For more information on affective computing, visit the Discovering Computers 2002 Issues Web page (scs.site.com/dc2002/issues.htm) and click Chapter 5 Issue #1.

WHAT ARE INPUT DEVICES?

An **input device** is any hardware component that allows you to enter data, programs, commands, and user responses into a computer. Depending on your particular application and requirement, the input device you use may vary. Popular input devices include the keyboard, mouse, stylus, microphone, digital camera, and scanner. The following pages discuss these and other input devices.

Storage devices, such as disk drives, serve as both input and output devices. Chapter 7 discusses storage devices.

THE KEYBOARD

Many people use a keyboard as one of their input devices. A **keyboard** is an input device that contains keys you press to enter data into the computer (Figure 5-3).

Desktop computer keyboards typically have from 101 to 105 keys. Keyboards for smaller computers such as notebook computers contain fewer keys. A computer keyboard includes keys that allow you to type letters of the alphabet, numbers, spaces, punctuation marks, and other symbols such as the dollar sign (\$) and asterisk (*). A keyboard also contains other keys that allow you to enter data and instructions into the computer.

All computer keyboards have a typing area that includes the letters of the alphabet, numbers, punctuation

marks, and other basic keys. Many desktop computer keyboards also have a numeric keypad on the right side of the keyboard. A **numeric keypad** is a calculator-style arrangement of keys that includes numbers, a decimal point, and some basic mathematical operators (see Figure 5-3). Many users prefer to use the numbers on the numeric keypad instead of the numbers at the top of the typing area.

Across the top of most keyboards are function keys, which are labeled with the letter F followed by a number (see Figure 5-3). **Function keys** are special keys programmed to issue commands to a computer. The command associated with a function key depends on the program you are using. For example, in many programs, pressing the function key F1 displays a Help window. When instructed to press a function key such as F1, do not press the letter F followed by the number 1. Instead, press the key labeled F1.

To issue commands, you often use function keys in combination with other special keys (SHIFT, CTRL, ALT, and others). With many programs, you can use a button, a menu, a function key, or a combination of keys

to obtain the same result (Figure 5-4).

Keyboards also contain keys that allow you to position the insertion point. The **insertion point** is a symbol that indicates where on the screen the next character you type will display (Figure 5-5). Depending on the program, the symbol may be a vertical bar, a rectangle, or an underline. You can move the insertion point left, right, up, or down by pressing the arrow keys on the keyboard.

Keyboards typically contain at least four **arrow keys**: one pointing up, one pointing down, one pointing left, and one pointing right. Most keyboards also contain keys such as HOME, END, PAGE UP, and PAGE DOWN, that you can press to move the insertion point to the beginning or end of a line, page, or document.

Nearly all keyboards have toggle keys. A **toggle key** is a key that switches between two different states. The NUM LOCK key, for example, is a toggle key (see Figure 5-3). When you press it once, it locks the numeric keypad so you can use this keypad to type numbers. When you press the NUM LOCK key again, the numeric keypad unlocks so the same keys serve as arrow keys that move the

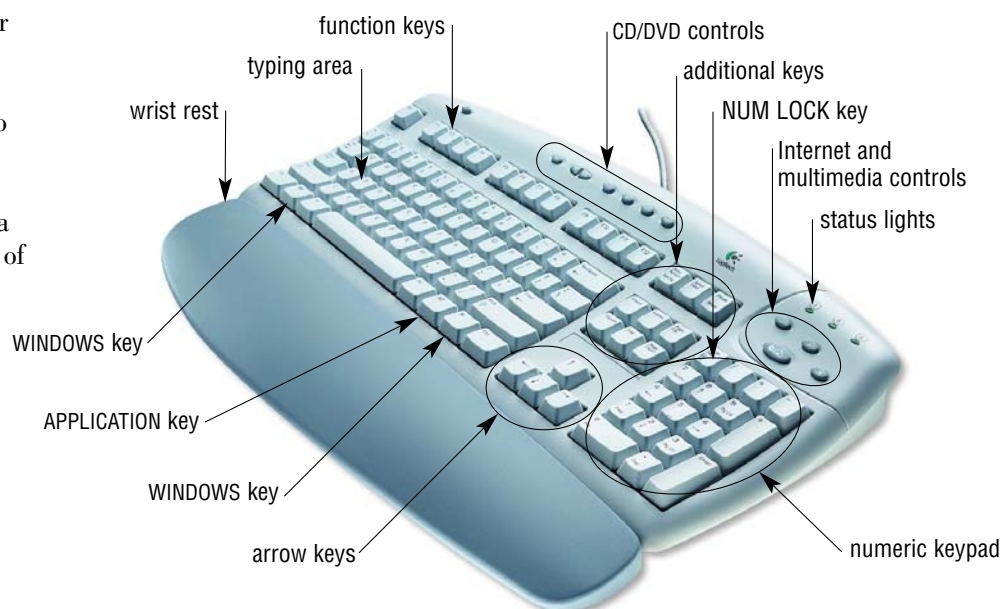


Figure 5-3 A desktop computer keyboard. You type using keys in the typing area and on the numeric keypad.

Web Link

For more information on keyboards, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Keyboards.

insertion point. Many keyboards have status lights that light up when you activate a toggle key.

Most keyboards have a **WIN-DOWS** key and an **APPLICATION** key. The **WINDOWS** key displays the Start menu. The **APPLICATION** key displays an item's shortcut menu.

Newer keyboards also include buttons that allow you to access your CD/DVD drive, adjust speaker volume, open your e-mail program, start your Web browser, and search the Internet. Some keyboards even have USB ports so you can plug USB devices directly into the keyboard instead of the back of the system unit.

Keyboard Types

A standard computer keyboard sometimes is called a **QWERTY keyboard** because of the layout of its typing area. That is, the first six leftmost letters on the top alphabetic line of the keyboard spell QWERTY (pronounced KWER-tee).

Most of today's desktop computer keyboards are enhanced keyboards. An **enhanced keyboard** has 12 function keys along the top, 2 CTRL keys, 2 ALT keys, and a set of arrow and additional keys between the typing area and the numeric keypad (see Figure 5-3).

Command	Button	Menu	Function Key(s)
Copy		Edit Copy	SHIFT+F2
Open		File Open	CTRL+F12
Print		File Print	CTRL+SHIFT+F12

Figure 5-4 Many programs allow you to use a button, a menu, or a function key to obtain the same result, as shown by these examples from Microsoft Word.

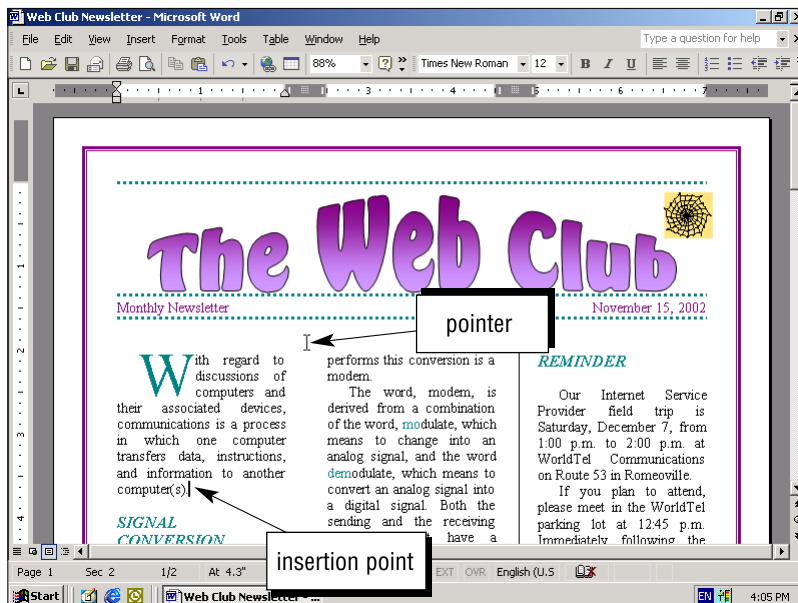


Figure 5-5 In most Windows programs, such as Word, the insertion point is a blinking vertical bar. You can use the keyboard or the mouse to move the insertion point. The pointer, another symbol that displays on the screen, is controlled using a pointing device such as a mouse.

Most keyboards attach to a serial port, or a keyboard port, or a USB port on the system unit via a cable. Some keyboards, however, do not use wires at all. A **cordless keyboard** is a battery-powered device that transmits data using wireless technology, such as radio waves or infrared light waves. These cordless devices communicate with a receiver that attaches to a port on the system unit. The port type varies depending on the type of wireless technology.

On notebook and many handheld computers, the keyboard is built into the top of the system unit (Figure 5-6). To fit in these smaller computers, the keyboards usually are smaller and have fewer keys. Most desktop computer keyboards have at least 101 keys. A typical notebook computer keyboard, by contrast, usually has about 85 keys. To provide all of the functionality of a desktop computer keyboard, manufacturers design many of the keys to serve two or three different purposes.



Figure 5-6 On notebook and many handheld computers, the keyboard is built into the top of the system unit.

Users of handheld computers that do not have keyboards sometimes prefer to work with a portable keyboard to enter data. A **portable keyboard** is a full-sized keyboard you conveniently can attach and remove from a handheld computer. Figure 5-7 shows a pocket-sized portable keyboard that unfolds into a full-sized keyboard.

Regardless of size, many keyboards have a rectangular shape with the keys aligned in rows. Users who spend a large amount of time typing on these keyboards sometimes experience repetitive strain injuries

(RSI) of their wrists. For this reason, some manufacturers offer ergonomic keyboards. An **ergonomic keyboard** has a design that reduces the chance of these wrist injuries (Figure 5-8). Even keyboards that are not ergonomically designed attempt to offer a user more comfort. For example, many keyboards today include a wrist rest or palm rest to reduce strain on your wrist while typing (see Figure 5-3 on page 5.4).

The goal of **ergonomics** is to incorporate comfort, efficiency, and safety into the design of items in the workplace. Employees can be injured or develop disorders of the muscles, nerves, tendons, ligaments, and joints from working in an area that is not ergonomically designed. Thus, OSHA (Occupational Safety & Health Administration) has proposed standards whereby employers must establish programs that prevent these types of injuries or disorders.



Figure 5-7 This convenient, portable keyboard unfolds into a full-sized keyboard that you can attach to a handheld computer.



Figure 5-8 The Microsoft Natural Keyboard Pro is an ergonomic keyboard designed to minimize strain on your hands and wrists.

ISSUE

Protecting You from Workplace Injuries

Ergonomics and Your Health

The Bureau of Labor Statistics reports that work-related musculoskeletal disorders (MSDs) account for one-third of all occupational injuries and illnesses. These disorders are the largest job-related injury and illness problem in the United States today. OSHA (see URL below) has proposed standards whereby employers must establish programs that prevent workplace injuries with respect to computer usage. If these standards are approved and initiated, the cost to employers and society will be millions of dollars. What is your opinion of this proposal? Should this proposal be implemented? Whose responsibility is this — employees or employer? Will this have a detrimental affect on small businesses?

For more information on OSHA, ergonomics, and the Web site mentioned above, visit the Discovering Computers 2002 Issues Web page (scsite.com/dc2002/issues.htm) and click Chapter 5 Issue #2.

POINTING DEVICES

A **pointing device** is an input device that allows you to control a pointer on the screen. In a graphical user interface, a **pointer** is a small symbol on the screen (see Figure 5-5 on page 5.5). A pointer often takes the shape of an I-beam (I), a block arrow (➡), or a pointing hand (☞). Using a pointing device, you can position the pointer to move or select items on the screen. For example, you can use a pointing device to move the insertion point; select text, graphics, and other objects; and click buttons, icons, links, and menu commands.

The following sections discuss common pointing devices.

MOUSE

A **mouse** is a pointing device that fits comfortably under the palm of your hand. The mouse is the most widely used pointing device on desktop computers.

With a mouse, you control the movement of the pointer, often called a **mouse pointer**, on the screen and make selections from the screen. The top of a mouse has one to four buttons; some also have a small wheel. The bottom of a mouse is flat and contains a mechanism that detects movement of the mouse.

Mouse Types

A **mechanical mouse** has a rubber or metal ball on its underside (Figure 5-9). When the ball rolls in a certain direction, electronic circuits in the mouse translate the movement of the mouse into signals the computer

understands. You should place a mechanical mouse on a mouse pad. A **mouse pad** is a rectangular rubber or foam pad that provides better traction than the top of a desk. The mouse pad also protects the ball in the mouse from a build up of dust and dirt, which could cause it to malfunction.

An optical mouse, by contrast, has no moving mechanical parts inside. Instead, an **optical mouse** uses devices that emit and sense light to detect the mouse's movement (Figure 5-10). Some use optical sensors; others use laser. You can place an optical mouse that uses optical sensors on nearly all types of surfaces, eliminating the need for a mouse pad. An optical mouse that uses laser usually requires a special mouse pad. An optical mouse is more precise than a mechanical mouse and does not require cleaning like a mechanical mouse, but it also is slightly more expensive.

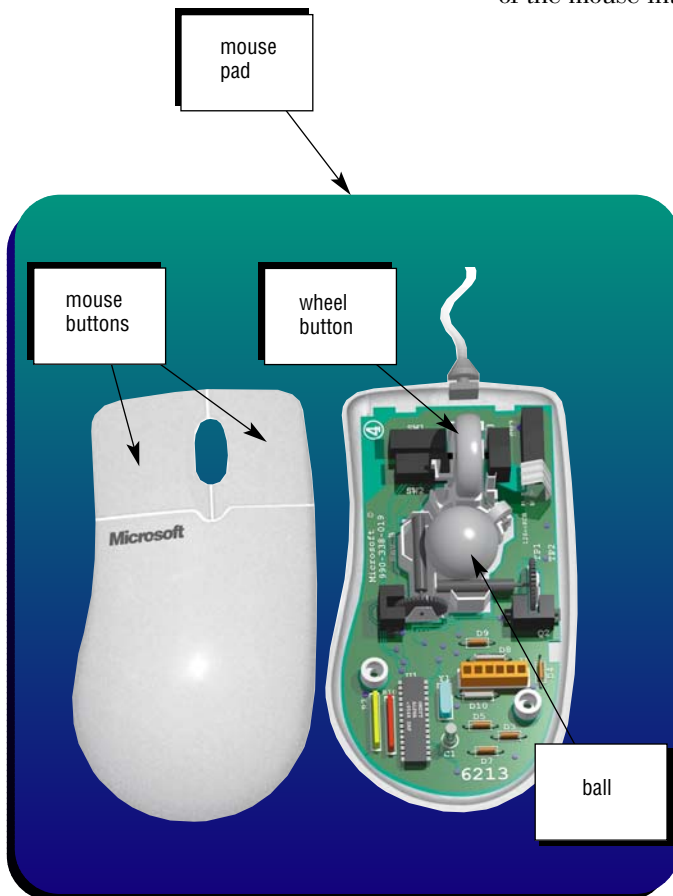


Figure 5-9 A mechanical mouse contains a small ball.



Figure 5-10 This optical mouse uses an optical sensor. It also includes buttons you push with your thumb that enable you to navigate forward and backward through Web pages.

Web Link

For more information on a mouse, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Mouse.

TECHNOLOGY TRAILBLAZER**DOUGLAS ENGELBART**

Without Douglas Engelbart, it is unlikely the phrase *point and click* would be part of our vocabulary. As a scientist at the Stanford Research Institute in the 1960s, Engelbart was part of a team that designed the first mouse with funding from NASA and the U.S. Department of Defense. The mouse prototype had a cord in the front, but Engelbart switched it to the rear to move it out of the way. He would tilt or rock that mouse to draw straight lines, and then he would push it and lift it off the desk to let the two perpendicular wheels on the bottom spin, which moved the cursor across the screen.

Even though he filed a patent for his design in 1965, Engelbart's thinking was too ahead of his time to reach fruition. Xerox's Palo Alto engineers refined Engelbart's ideas 10 years later and showed the redesigned product to Apple's Steve Jobs, who applied the concept to his graphical Macintosh and had the mouse mass produced in the mid-1980s.

For more information on Douglas Engelbart, visit the Discovering Computers 2002 People Web page (scsite.com/dc2002/people.htm) and click Douglas Engelbart.



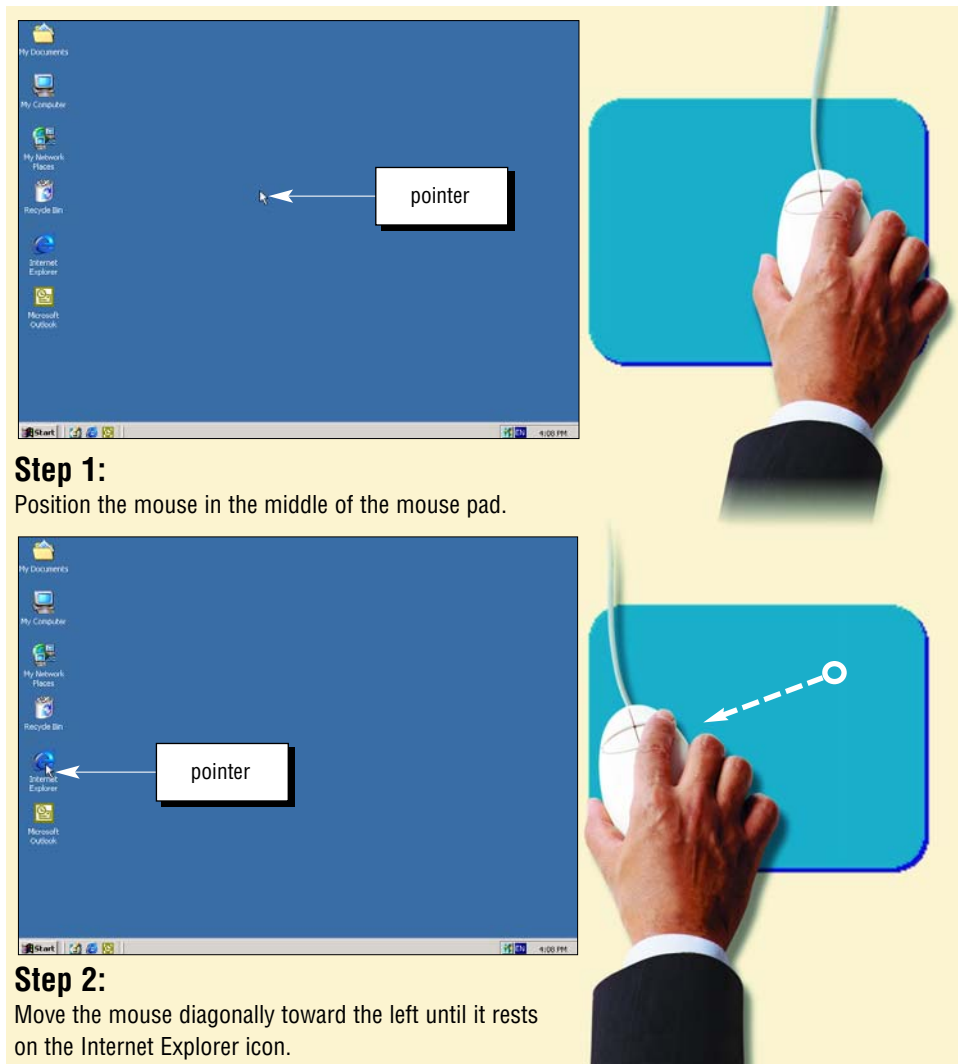
A mouse can connect to your computer in several ways. Most have a cable that attaches to a serial port, a mouse port, or USB port on the computer. A **cordless mouse** or **wireless mouse** is a battery-powered device that transmits data using wireless technology, such as radio waves or infrared light waves. The wireless technology used for a cordless mouse is very similar to that of a cordless keyboard discussed earlier. Some users prefer a cordless mouse because it frees up desk space and eliminates the clutter of a cord.

Using a Mouse

As you move the mouse, the pointer on the screen also moves. For example, when you move the mouse to the left, the pointer moves left on the screen (Figure 5-11). When you move the mouse to the right, the pointer moves right on the screen, and so on. If you have never worked with a mouse, you might find it a little awkward at first. With a little practice, however, you will discover that a mouse is quite easy to use.

Generally, you use the mouse to move the pointer on the screen to an object such as a button, a menu, an icon, a link, or text. Then, you press a mouse button to perform a certain

Figure 5-11 HOW TO MOVE THE POINTER WITH A MOUSE



action on that object. Windows users work with a mouse that has at least two buttons. For example, if you point to the Internet Explorer button on the taskbar and then press, or *click*, the primary mouse button, the browser displays a Web page on the screen. For a right-handed user, the left button usually is the primary mouse button and the right mouse button is the secondary mouse button. Left-handed people, however, can reverse the function of these buttons.

In addition to clicking, you can perform other operations using the mouse. These operations include point, right-click, double-click, drag, and right-drag. The table in Figure 5-12 explains how to perform these and other mouse operations. Some programs also use keys in combination with the mouse to perform certain actions.

As mentioned earlier, sometimes a mouse has a wheel that you can use with certain programs (see Figure 5-9 on page 5.7 and Figure 5-10 on page 5.7). You rotate or press the wheel to move text and objects on the screen. The function of the mouse buttons and the wheel varies depending on the program.

COMPANY ON THE CUTTING EDGE



Mice Are Welcome Here

Thinking about a room full of mice can send chills down your spine. But Logitech employees are not bothered by all the mice in their offices; in fact, they smile when they think of these creatures.

Logitech is the world's largest manufacturer of the mouse, having created more than 200-million corded and cordless devices since 1981. The company also designs, produces, and markets a variety of other input devices, including keyboards, optical trackballs, joysticks, gamepads, and Internet video cameras. Cordless products account for more than one-third of the devices sold.

More than one-half of Logitech's engineers are software engineers, and they have used their innovative design and technological expertise to help the company win more than 50 worldwide awards. Among their 25 industry firsts are the cordless and opto-mechanical mouse devices, the color handheld scanner, and the digital still camera.

For more information on Logitech, visit the Discovering Computers 2002 Companies Web page (scsite.com/dc2002/companies.htm) and click Logitech.

Operation	Mouse Action	Example
Point	Move the mouse across a flat surface until the pointer on the desktop rests on the item of choice.	Position the pointer on the screen.
Click	Press and release the primary mouse button, which usually is the left mouse button.	Select or deselect items on the screen or start a program or program feature.
Right-click	Press and release the secondary mouse button, which usually is the right mouse button.	Display a shortcut menu.
Double-click	Quickly press and release the left mouse button twice without moving the mouse.	Start a program or program feature.
Drag	Point to an item, hold down the left mouse button, move the item to the desired location on the screen, and then release the left mouse button.	Move an object from one location to another or draw pictures.
Right-drag	Point to an item, hold down the right mouse button, move the item to the desired location on the screen, and then release the right mouse button.	Display a shortcut menu after moving an object from one location to another.
Rotate wheel	Roll the wheel forward or backward.	Scroll up or down a few lines.
Press wheel button	Press the wheel button while moving the mouse on the desktop.	Scroll continuously.

Figure 5-12 The more common mouse operations.

OTHER POINTING DEVICES

The mouse is the most widely used pointing device today. Some users, however, work with other pointing devices. These include the trackball, touchpad, pointing stick, joystick, wheel, light pen, touch screen, and stylus. The following sections discuss each of these pointing devices.

Trackball

Whereas a mechanical mouse has a ball on the bottom, a **trackball** is a stationary pointing device with a ball on its top (Figure 5-13). The ball in most trackballs is about the size of a Ping-Pong ball.

To move the pointer using a trackball, you rotate the ball with your thumb, fingers, or the palm of your hand. In addition to the ball, a trackball usually has one or more buttons that work just like mouse buttons.

A trackball requires frequent cleaning because it picks up oils from your fingers and dust from the environment. If you have limited desk space, however, a trackball is a good alternative to a mouse because you do not have to move the entire device.

Touchpad

A **touchpad** or **trackpad** is a small, flat, rectangular pointing device that is sensitive to pressure and motion (Figure 5-14). To move the pointer using a touchpad, you slide your fingertip across the surface of the pad. Some touchpads have one

or more buttons around the edge of the pad that work like mouse buttons. On many touchpads, you also can tap the pad's surface to imitate mouse operations such as clicking.

You can attach a stand-alone touchpad to any personal computer. You find them more often on notebook computers.

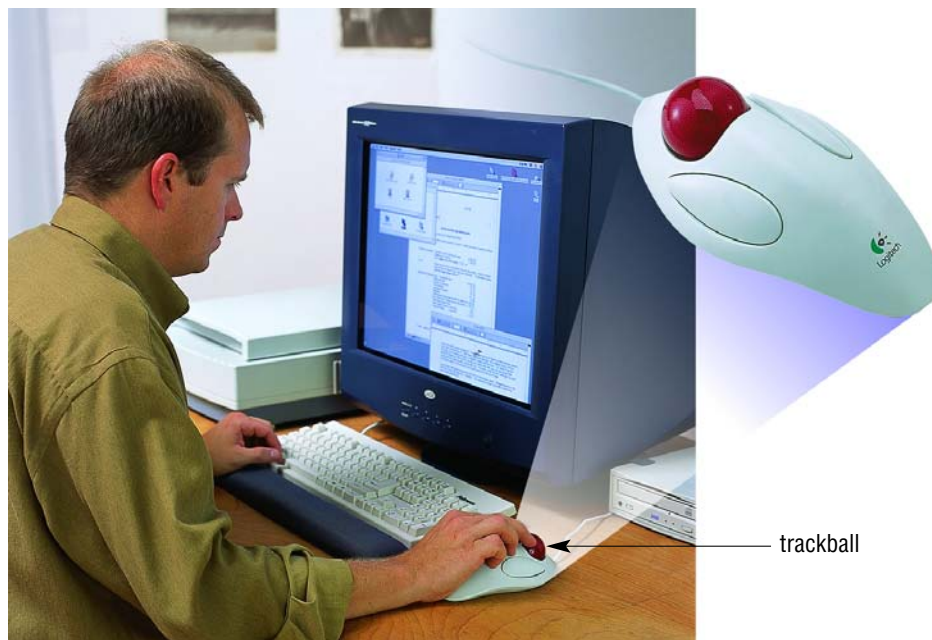


Figure 5-13 A trackball is like an upside-down mouse. You rotate the ball with your thumb, fingers, or palm of your hand to move the pointer.

Web Link

For more information on trackballs, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Trackballs.

Web Link

For more information on touchpads, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Touchpads.



Figure 5-14 Many notebook computers have a touchpad that you can use to control the movement of the pointer.

Pointing Stick

A **pointing stick** is a pressure-sensitive pointing device shaped like a pencil eraser that is positioned between keys on the keyboard (Figure 5-15). To move the pointer using a pointing stick, you push the pointing stick with your finger. The pointer on the screen moves in the direction you push the pointing stick.

A pointing stick does not require any additional desk space. In addition, it does not require cleaning like a mechanical mouse or trackball. IBM first developed the pointing stick for its notebook computers. Whether you select a notebook computer that has a touchpad or pointing stick is a matter of personal preference.



Figure 5-15 Some notebook computers use a pointing stick to control the movement of the pointer.

Web Link

For more information on pointing sticks, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Pointing Sticks.

Joysticks and Wheels

Users running game software or flight and driving simulation software often use a joystick or wheel as a pointing device (Figure 5-16). A **joystick** is a vertical lever mounted on a base. You move the lever in different directions to control the actions of a vehicle or player. The lever usually includes buttons called triggers you can press to activate certain events. Some joysticks also have additional buttons you can set to perform other actions.

A **wheel** is a steering-wheel type input device. You turn the wheel to drive a car, truck, or other vehicle. Most wheels also include foot pedals for acceleration and braking actions. A joystick and wheel typically attach via a cable to the game port on a sound card or game card or to a USB port.



Figure 5-16 Joysticks and wheels help the user control the actions of players and vehicles in game and simulation software.

Light Pen

A **light pen** is a handheld input device that contains a light source or can detect light. Some light pens require a specially designed monitor, while others work with a standard monitor. To select objects on the screen, you press the light pen against the surface of the screen or point the light pen at the screen and then press a button on the pen.

Health care professionals, such as doctors and dentists, use light pens because they can slide a protective sleeve over the pen — keeping their fingers free of contaminants (Figure 5-17). Light pens also are ideal for areas where employees hands might contain food, dirt, grease, or other chemicals that could damage the computer. Applications with limited desktop space such as industrial or manufacturing environments find light pens convenient, as well.



Figure 5-17 To make selections with a light pen, you touch the pen against the surface of the screen or point the pen at the screen and then press a button on the pen.

Touch Screen

A **touch screen** is a touch-sensitive display. You interact with the device by touching areas of the screen with your finger (Figure 5-18). Because they require a lot of arm movements, you do not enter large amounts of data into touch screens. Instead, you touch words, pictures, numbers, or locations identified on the screen.

Kiosks located in stores, hotels, airports, and museums often have touch screens. So you easily can access your bank account from your car, many ATM machines have touch screens. Many computers in restaurants, cafeterias, gift shops, and resorts have touch screens. Some notebook computers even have touch screens.

Instead of using your finger, some touch screens use a stylus. The next section discusses this device.



Figure 5-18 You interact with a touch screen by touching areas of the screen with your finger.

Stylus

A **stylus** looks like a ballpoint pen, but uses pressure, instead of ink, to write text and draw lines. This device, originally called a **pen** or electronic pen, was used in professional graphical applications such as computer-aided design and drafting. The following paragraphs describe how these and many other applications today use a pen, also known as a stylus.

Architects, mapmakers, artists, and designers create drawings and sketches by using an electronic pen on a graphics tablet. A **graphics tablet**, also called a **digitizer** or **digitizing tablet**, is a flat, rectangular, electronic plastic board. Each location on the graphics tablet corresponds to a specific location on the screen. When you draw on the tablet with the pen, the tablet detects and converts the movements into digital signals that are sent into the computer. These pens are quite sophisticated, featuring erasers and programmable buttons. In addition to a pen, some graphics tablets also use a cursor. A **cursor** is a device that looks similar to a mouse, except it has a window with cross hairs, so the user can see through to the tablet (Figure 5-19).

Pens used for handwriting recognition have grown in popularity. Using special software along with a pen and graphics tablet, you can send handwritten notes via e-mail or sign your name electronically (Figure 5-20). Upon receipt, the receiver sees your handwritten note or signature in its original form. Businesses save time using **electronic signatures**, also called **e-signatures**, which are just as legal as an ink signature.

Web Link

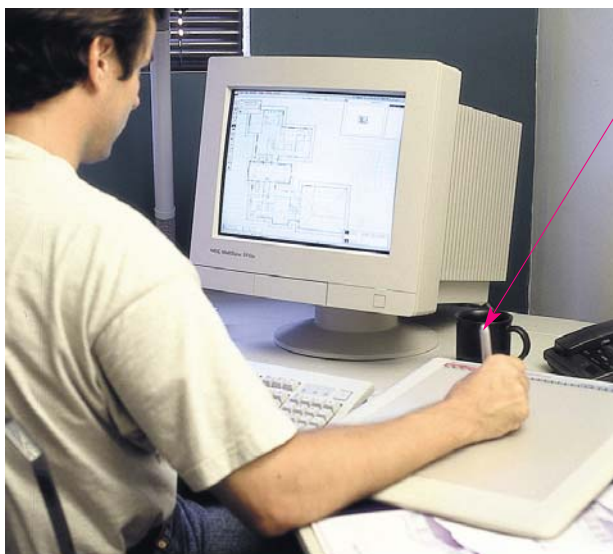
For more information on a stylus, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Stylus.

Web Link

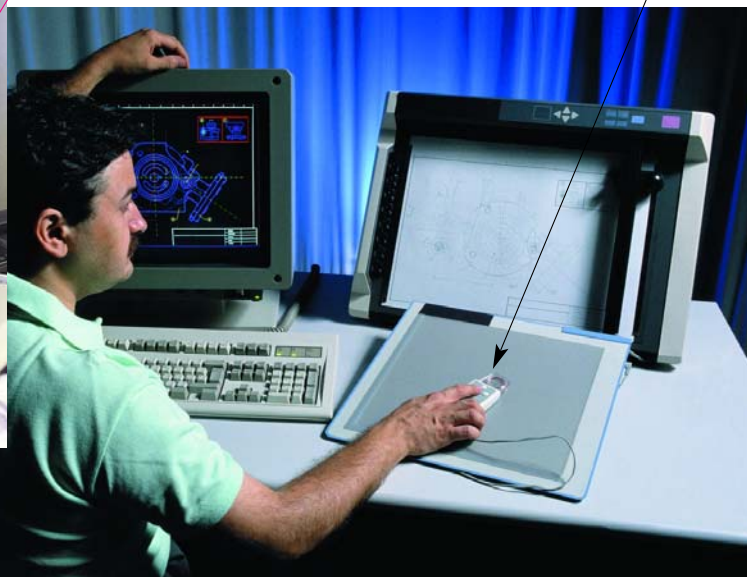
For more information on e-signatures, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click E-signatures.



Figure 5-20 With digital signatures just as legal as ink signatures, the demand for graphics tablets and pens is growing.



pen



cursor

Figure 5-19 Architects, mapmakers, artists, and designers create drawings and sketches with an electronic pen on a graphics tablet. Other tablets use a cursor as the input device.

Some notebook and many handheld computers have touch screens that allow you to input data using a stylus (Figure 5-21). Instead of using a keyboard, you write or make selections on the computer screen with the stylus. These computers use **handwriting recognition software** that translates handwritten letters and symbols into characters that the computer understands. A later section in this chapter discusses handheld computer input and handwriting recognition software in more depth.

COMPANY ON THE CUTTING EDGE



Ubiquitous Palm Is a Phenomenon

Oprah has one. So do Murphy Brown and the media spinners in the hit movie, *Wag the Dog*. Indeed, more than two million people worldwide have a Palm handheld computer in their pocket or purse or briefcase to help them manage and organize their professional and personal lives.

The Palm handheld computer, manufactured by Palm, Inc., commands more than three-fourths of the handheld computer market. More than 43,000 developers are working on new software applications and hardware add-ons for this versatile and stylish product. Currently, software for Palm handhelds enables users to perform a multitude of tasks, including read e-books, record golf scores, and play games.

Palm was founded in 1992 and acquired by U.S. Robotics in 1995. One year later, the company introduced the Pilot 1000 and 5000 products, which blazed a trail for the handheld market. In 1997, 3Com acquired U.S. Robotics and made Palm a subsidiary of the corporation. Two years later, 3Com made Palm an independent, publicly traded company.

For more information on Palm, visit the Discovering Computers 2002 Companies Web page (scsite.com/dc2002/companies.htm) and click Palm.

VOICE INPUT

Voice input is the process of entering data by speaking into a microphone that is attached to the sound card on the computer. As an alternative to using a keyboard to input data, many users are talking to their computers.

Voice recognition, also called **speech recognition**, is the computer's capability of distinguishing spoken words (Figure 5-22). Voice recognition programs do not understand speech. They only recognize a vocabulary of pre-programmed words. The vocabulary of voice recognition programs can range from two words to millions of words. The automated telephone system at your bank may ask you to answer questions by speaking the words Yes or No into the telephone. A voice recognition program on your computer, by contrast, may recognize up to two million words!

In the past, voice recognition systems were found only in specialized applications in which a user's hands

were occupied or disabled. Today, voice recognition applications are affordable and easy to use, providing all types of users with a convenient form of input. Some productivity software, such as word processing and spreadsheet, include voice recognition as part of the product. For example, you can dictate memos and letters into your word processing program instead of typing them. You can issue commands to your software applications, search the Web, participate in chat rooms, and send and receive e-mail and instant messages — all by speaking into a microphone.

The first voice recognition programs were speaker dependent. Today, most are speaker independent. With **speaker-dependent software**, the computer makes a profile of your voice, which means you have to train the computer to recognize your voice.



Figure 5-21 Many handheld computers support handwriting input through a stylus.

To train the computer, you must speak each of the words in the vocabulary into the computer repeatedly. After hearing the spoken word repeatedly, the program develops and stores a digital pattern for the word. When you later speak a word, the program compares the spoken word to those stored. **Speaker-independent software** has a built-in set of word patterns. That is, you do not have to train a computer to recognize your voice. Many products today include a built-in set of words that grows as the software learns your words.

Some voice recognition software requires **discrete speech**, which means you have to speak slowly and separate each word with a short pause. Most of today's products, however, allow you to speak in a flowing conversational tone, called **continuous speech**.

ISSUE

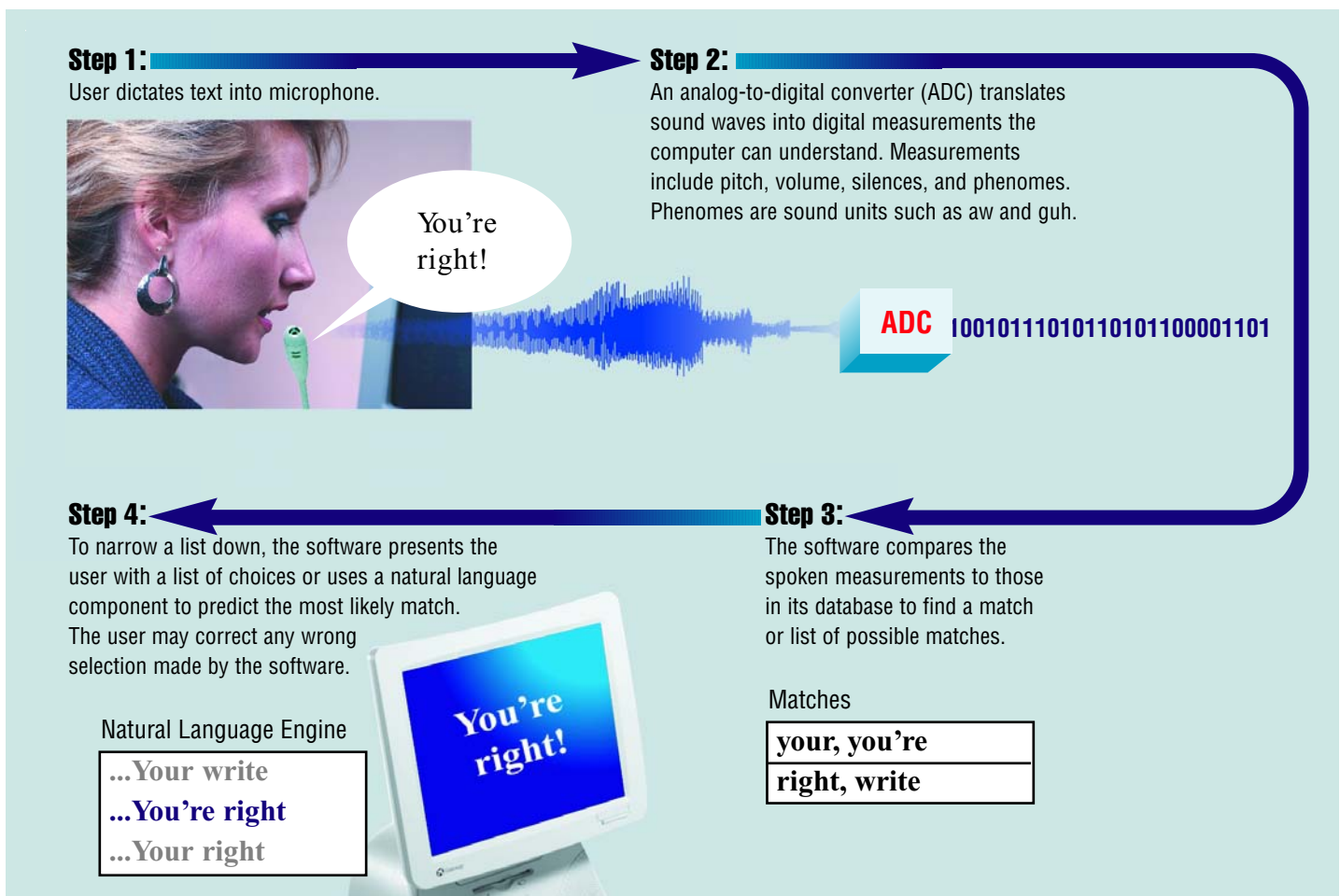
Talk to Your Computer

The Accuracy of Voice Recognition Software

Voice recognition is a process accomplished through software that allows users to interact with their computer by voice. Even though improvements have been made within voice recognition software, it still is not perfect. Experts agree voice recognition capability represents the future of software. Experts do not agree, however, that the future is now. The best voice recognition programs are 90 to 95 percent accurate. Yet, advocates admit this assessment is based on expected speech and vocabulary. When confronted with unusual dialogue, accuracy drops. Even a 90 percent accuracy rate means 1 out of 10 words will be wrong. Before we can use voice recognition software effectively, how accurate must it be? When would voice recognition be an advantage? Might it ever be a disadvantage? Why? Would you use voice recognition software?

For more information on voice recognition, visit the Discovering Computers 2002 Issues Web page (scs.site.com/dc2002/issues.htm) and click Chapter 5 Issue #3.

Figure 5-22 HOW VOICE RECOGNITION WORKS



Audio Input

Voice input is part of a larger category of input called audio input. **Audio input** is the process of entering any sound into the computer such as speech, music, and sound effects. To input high-quality sound, your personal computer must have a sound card. You can input sound via a device such as a microphone, tape player, CD player, or radio, each of which plugs into a port on the sound card.

With a microphone plugged into the microphone port on the sound card, you can record any sound, including speech. Windows stores audio files as **waveforms**, which are

called **WAV** files and have a .wav extension. Once you save the sound in a file, you can play it using the Sound Recorder. You can attach the audio file to an e-mail message or include it in a document such as a word processing report or presentation graphics slide show.

WAV files often are large – requiring more than 1 MB of storage space for a single minute of audio. For this reason, WAV files often are compressed so they take up less storage space.

You can input music and other sound effects using external MIDI devices such as an electronic piano keyboard (Figure 5-23). Discussed in

the previous chapter, in addition to being a port, MIDI (musical instrument digital interface) is the electronic music industry's standard that defines how digital musical devices represent sounds electronically. These devices connect to the sound card on your computer. Software programs that conform to the MIDI standard allow you to compose and edit music and other sounds. For example, you can change the speed, add notes, or rearrange the score to produce an entirely new sound.

INPUT DEVICES FOR HANDHELD COMPUTERS

Handheld computers today are very popular for both home and business users (Figure 5-24). Available in a variety of sleek colors, they include many features such as a calendar, appointment book, calculator, memo pad, and wireless Web and e-mail access.

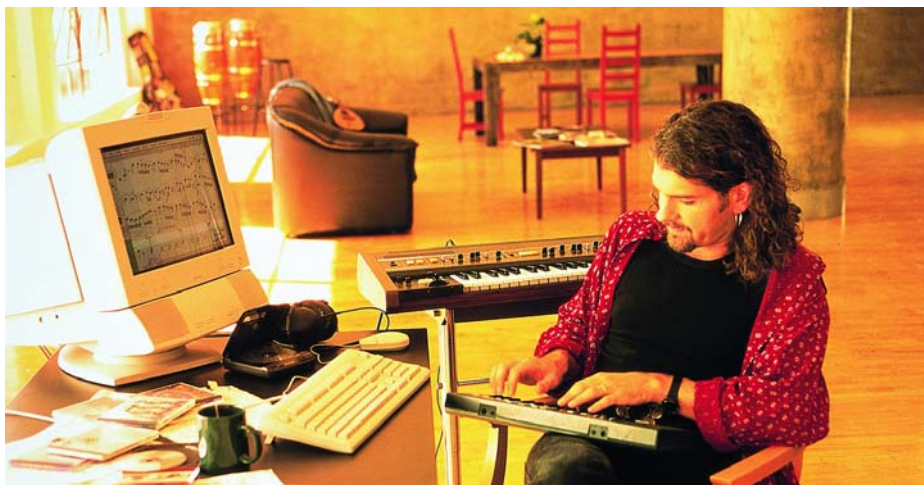


Figure 5-23 An electronic piano keyboard is an external MIDI device that can record music. You can store the music in the computer.

Web Link

For more information on handheld computer input, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scs.site.com/dc2002/ch5/weblink.htm) and click Handheld Computer Input.



Figure 5-24 Handheld computers today are available in a wide range of colors.

To satisfy the input needs of many different types of users, handheld computers provide many different ways to input data (Figure 5-25). The primary input method on most is the stylus. A handheld computer typically includes a basic stylus. You can purchase more elaborate models that have a ballpoint pen at one end and a stylus at the other. With the stylus, you can enter data in two ways: use an on-screen keyboard or use handwriting recognition software. Each handheld computer uses its own handwriting recognition software. For example, the Palm products use Graffiti®.

Instead of using a stylus, you can attach a full-sized keyboard to your handheld computer. You also can type onto your desktop computer and transfer the data into your handheld computer and vice-versa. As an alternative to typing, many handheld computers support voice input so you can enter data and instructions by speaking into the device. If you want to take photographs and view them on your handheld computer, you can attach a digital camera directly to many handheld computer models.



Figure 5-25 Data can be input into a handheld computer using a variety of techniques.

TECHNOLOGY TRAILBLAZER

DONNA DUBINSKY

As if being the president and CEO of 3Com's Palm Computing Division were not enough of a challenge, Donna Dubinsky founded Handspring with Jeff Hawkins in 1998 with the goal of becoming the leading handheld computing device maker for the consumer market.

Before coming to Palm Computing, Dubinsky had served as director of distribution at Apple Computer and as an international vice president at Claris. At Palm, she and Hawkins introduced the PalmPilot personal organizer in 1996; sales of more than two million units make it the most-rapidly adopted new computing product ever manufactured. In an effort to learn how consumers actually use the Palm, she watched consumers open the PalmPilot boxes and read the manuals. She even took some technical support calls herself to see what questions they were asking.

Craving her independence and autonomy at Handspring, Dubinsky is using the Palm operating system on its Visor handheld computer. She stresses that size, connectivity to a personal computer, usability, and an economical price are the factors that make handheld computers successful.

For more information on Donna Dubinsky, visit the Discovering Computers 2002 People Web page (scsite.com/dc2002/people.htm) and click Donna Dubinsky.



DIGITAL CAMERAS

A **digital camera** allows you to take pictures and store the photographed images digitally, instead of on traditional film (Figure 5-26). Mobile users such as real estate agents, general contractors, and photojournalists use a digital camera so they immediately can view photographed images right on the camera. Home and business users have digital cameras to save the expense of film developing, duplication, and postage. These users can share images with family, friends, co-workers, and clients by posting the photographs on a Web site or e-mailing them. You also can add dazzling special effects and print multiple

copies of an image from the comfort of your home or office.

Digital cameras use a variety of techniques to store images. These include floppy disk, SuperDisk, Klik! disk, PC Card, compact flash card, memory stick, mini-CD, and micro-drive. Chapter 7 discusses each of these storage media in depth. Generally, the more expensive cameras use higher-capacity storage devices, which means they can hold more pictures.

With many digital cameras, you can review and edit the images while they are in the camera. You also can connect some cameras directly to a printer or television. If you prefer, you can work with the images on your

desktop personal computer. To do this, you **download**, or transfer a copy of, the pictures from the digital camera to the computer. With some cameras, you connect a cable between the digital camera and a serial port or USB port on the computer and then use special software included with the camera. As a faster alternative, some users purchase a reading device that attaches to a parallel port or USB port on the computer. With the media in a reading device, you can transfer the images from the media to the computer. For cameras that use a floppy disk, you simply insert the disk into the computer's disk drive and then copy the pictures to the computer.



Figure 5-26 Digital cameras are used for a variety of reasons. The images are viewable immediately on the camera. They also can be edited, printed, or posted on a Web page or photo community.

Once the pictures are on your computer, you can edit them with photo-editing software, print them, fax them, send them via e-mail, include them in another document, or post them to a Web site or photo community for everyone to see. You can add pictures to greeting cards, a computerized photo album, a family newsletter, certificates, and awards. Figure 5-27 illustrates how a digital camera transforms the captured

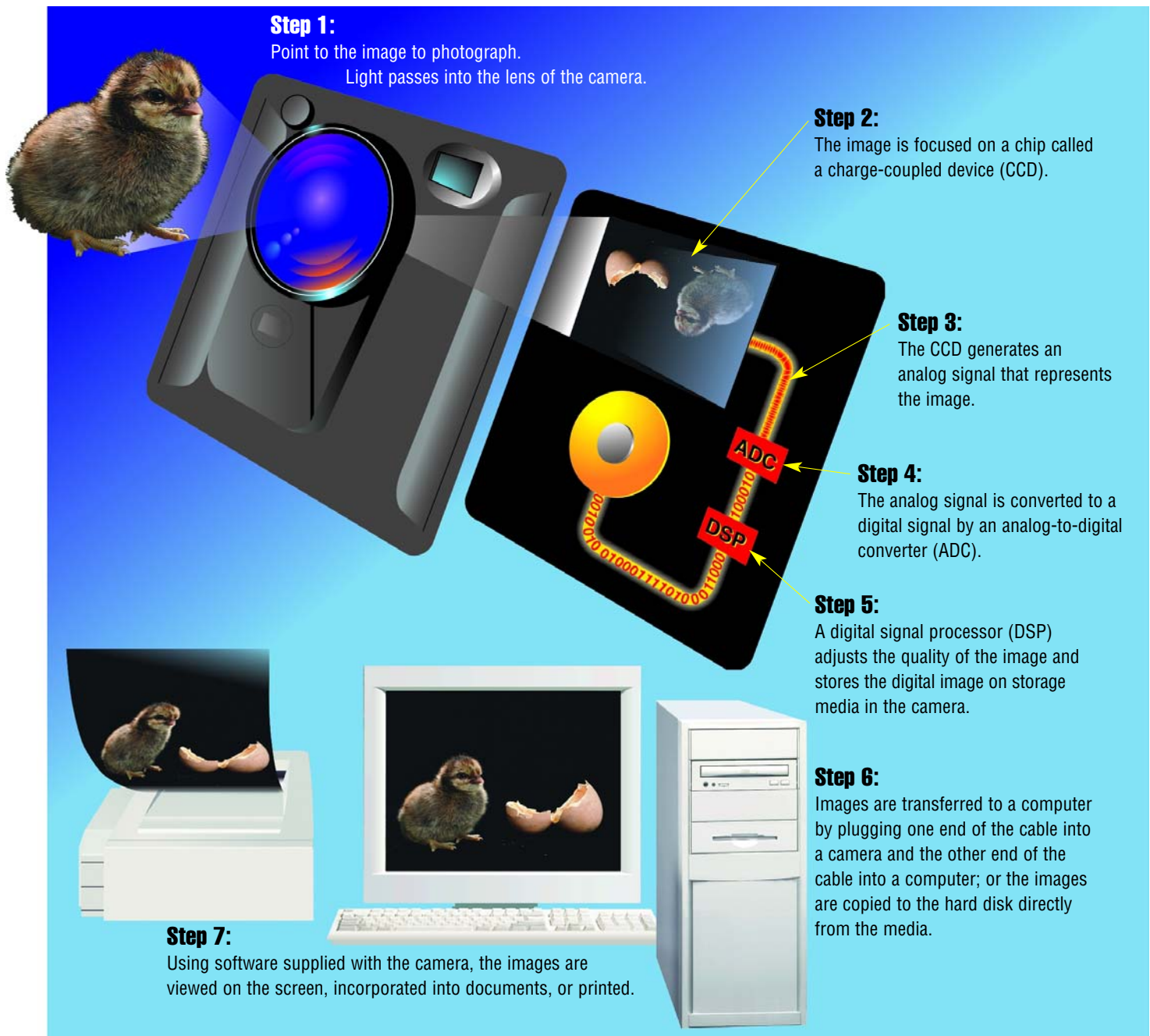
image into a screen display on your computer.

The three basic types of digital cameras are studio cameras, field cameras, and point-and-shoot cameras. The most expensive and highest quality of the three, a **studio camera** is a stationary camera used for professional studio work. Often used by photojournalists, a **field camera** is a portable camera that has many lenses and other attachments. Similarly to

the studio camera, a field camera can be quite expensive. A **point-and-shoot camera** is more affordable and lightweight and provides acceptable quality photographic images for the home or small business user.

A point-and-shoot camera often features flash, zoom, automatic focus, and special effects. With some, you can record short narrations for your pictures. Several of these cameras have a built-in TV out port that allows

Figure 5-27 HOW A DIGITAL CAMERA WORKS



you to display their pictures directly on your television screen. This camera is ideal for the home user and mobile users such as real estate agents, insurance agents, and general contractors.



Going Digital with Pictures

If you are considering purchasing a new camera in the near future, then consider going digital. Taking pictures with a digital camera is fast and easy. Similar to a traditional camera, you will find a wide price range for digital cameras. For a better idea of what you should purchase to fit your budget and lifestyle, consider the following:

1. If you want to print or publish your images on the Web, then resolution is important. Similar to your monitor, the higher the resolution, the better and sharper the picture.
2. Image storage is another feature to consider. Most digital cameras include some type of miniature removable storage media. The most popular of these media is flash memory, but some cameras use small hard disks or even the venerable floppy disk. The number of images you can store on one of these devices depends on the capacity, the resolution, and the amount of compression.
3. The type of lens you select affects how your pictures look. If you are going to be backpacking in the Rockies and want to take a close-up picture of a newly bloomed wildflower, then a macro lens is what you need. Or, if you want to take a picture of the moose on the next hill over, consider a zoom lens.
4. Perhaps the most important factor to consider is how much money you plan to spend. Determine your price and do some comparison shopping, using the above listed features as guidelines.

For links to digital camera sites, visit the Discovering Computers 2002 Apply It Web page (scsite.com/dc2002/apply.htm) and click Chapter 5 Apply It #1.

One factor that affects the quality of a digital camera is its resolution.

Resolution describes the sharpness and clearness of an image. The higher the resolution, the better the image quality, but the more expensive the camera. Some digital camera resolutions today exceed three million pixels. A **pixel** (short for *picture element*) is a single point in an electronic image (Figure 5-28). The greater the number of pixels the camera uses to capture an image, the better the quality of the image.

As a rule, a 1-megapixel (million pixel) camera is fine for screen displays such as photo communities, Web pages, and e-mail attachments. These low-end cameras cost a few hundred dollars. If you plan to print photographs larger than 5 x 7 inches, you should have at least a 2-megapixel (million pixel) camera. For images as good as film-based cameras, use a 3-megapixel camera. These high-end point-and-shoot cameras cost less than \$1,000.

Some manufacturers use dots per inch to represent a digital camera's resolution. **Dots per inch (dpi)** is the number of pixels in an inch of screen display. For example, a 1,600 x 1,200 (pronounced 1600 by 1200) dpi camera has 1,600 pixels per vertical inch and 1,200 pixels per horizontal inch. If just one number is

stated, such as 1,200 dpi, then both the vertical and horizontal numbers are the same. Digital cameras for the consumer range from 640 x 480 dpi to 1,792 x 1,200 dpi. On some cameras, you can adjust the dpi to the resolution you need. With a lower dpi, you can capture more images. For example, a camera set at 800 x 600 dpi might capture and store 61 images. The number of images reduces to 24 on the same camera set at 1,600 x 1,200 dpi.

The actual photographed resolution is known as the **optical resolution**. Some manufacturers state **enhanced resolution**, or **interpolated resolution**, instead of or in addition to optical resolution. Optical resolution is different from enhanced resolution. The enhanced resolution usually is higher because it uses a special formula to add pixels between those generated by the optical resolution.

Another measure of a digital camera's quality is the number of bits it stores in a dot. Each dot consists of one or more bits of data. The more bits used to represent a dot, the more colors and shades of gray that can be represented. One bit per dot is enough for simple one-color images. For multiple colors and shades of gray, each dot requires more than one bit of data. Your point-and-shoot camera should be at least 24 bit.



Figure 5-28 A pixel is a single point in an electronic image. In digital images, the pixel is a tiny square. When images are printed, pixels are circles of color.

VIDEO INPUT

Video input or **video capture** is the process of entering a full-motion recording into a computer and storing it on a storage medium. Many video devices use analog video signals. Computers, by contrast, use digital signals. To input video from these analog devices, the analog signal must be converted to a digital signal. To do this, you plug a video camera, VCR, or other analog video device into a video-in plug that is attached to the computer. One card that has a video-in plug is a video capture card. A **video capture card** is an expansion card that converts the analog video signal into a digital signal that a computer can understand. (Most new computers are not equipped with a video capture card because not all users need this type of card.)

A new generation of video cameras produces digital signals. A **digital video (DV) camera** is a video camera that records video as digital signals, instead of analog signals. In addition to video, you also can capture still frames with these cameras. A DV camera connects directly to a parallel port or USB port on the computer. Many DV cameras have a video-in plug. Thus, with a DV camera, you do not need a video capture card (Figure 5-29).

Once you connect the video device to the computer, you can begin recording. After you save the video on a storage medium, you can play it or edit it using video-editing software.

Just as with audio files, video files can require huge amounts of storage space. A three-minute segment, or clip, of high-quality video can require an entire gigabyte of storage

(equal to approximately 50 million pages of text). To decrease the size of the files, video often is compressed.

Video compression works by recognizing that only a small portion of a video image changes from frame to frame. A video compression program might store the first frame and then store only the changes from one frame to the next. The program assumes the next frames will be almost identical to the first. Before you view the video, the program decompresses the video segment. Instead of using software to decompress video, some computers have a video decoder. A **video decoder** is a card that decompresses video data. A video decoder is more effective and efficient than software.

If you do not want to save an entire video clip on your computer, you can use a **video digitizer** to capture an individual frame from an analog video and then save the still



Figure 5-29 You can capture home videos on VHS tapes by attaching an analog video camera to the video-in plug on a digital video camera.

Watching the Babysitter

PC Cameras and Your Privacy

Many of the computers you purchase today include a PC camera, which allows you to make video telephone calls or take snapshots. But how valuable is this? Is it really worth the extra money or the hidden cost built into the price of the computer? Some people may argue once you use this technology it will become a part of your repertoire and you will discover many uses. Do you think this is true? For instance, you could use the camera to monitor the babysitter or housekeeper. Do you agree with this? Why would the home user need or even want a PC camera? Can you list some other ways that you would use this technology?

For more information on PC cameras, visit the Discovering Computers 2002 Issues Web page (scs.site.com/dc2002/issues.htm) and click Chapter 5 Issue #4.

picture in a file. To do this, plug the analog recording device such as a video camera, VCR, or television into the video digitizer. The video digitizer then usually connects to a parallel port or USB port. While watching the video using special software, you can stop it and capture any single frame. The resulting files are similar to those that a digital camera generates.

PC Video Cameras

A **PC video camera**, or **PC camera**, is a DV camera that allows the home user to record, edit, and capture video and still images and to make video telephone calls on the Internet (Figure 5-30). During a **video telephone call**, both parties see each other as they talk. To provide security in your home, the PC camera can be set to take digital

photographs at preset time intervals or whenever it detects motion.

Attached to your computer's USB port, a PC camera usually sits on top of your monitor. For more flexibility, some PC cameras are portable. That is, you can detach them from the computer and use them anywhere.

Some PC cameras have a video-in plug, allowing you to attach a video camera or VCR directly to it. This enables you to create movies from existing videos. The cost of these cameras usually is less than a hundred dollars.

Many magazines and textbooks are beginning to use digital watermarks and PC cameras to connect printed media to the Web. A **digital watermark** is a small digital image that when held in front of a PC camera, displays an associated Web page on the computer screen.

PC video camera



Figure 5-30 A PC video camera can be used to capture, edit, and record video and to make video telephone calls on the Internet.

Web Cams

A **Web cam**, also called a **cam**, is a video camera whose output displays on a Web page. A Web cam attracts Web site visitors by showing images that change regularly (Figure 5-31). You could use a Web cam to show a work in progress, weather and traffic information, employees at work, photographs of a vacation, or any other images you wish to display.

Some Web sites have live Web cams that display still pictures and update the displayed image at a specified time or time intervals, such as 30 seconds. Another type of Web cam, called **streaming cam**, shows moving images by sending a continual stream of pictures.

Web cam



Figure 5-31 This Web cam shows the inside of a unique diner. The image is updated every 30 seconds.

ISSUE

Around the World in 80 Clicks

The Value of Web Cams

Consider going around the world in 80 clicks. It is possible. Take an online tour of the world at your leisure. Thousands of Web sites show live images through Web cams. These sites feature real-time (often 24-hour) views from every country in the world, and from places such as beaches, buildings, classrooms, dorm rooms, baby bassinets, fish tanks, taxicab dashboards, even inside a refrigerator. Or, how about a camera mounted on a bike, transmitting images through a cellular telephone? Some people may question the entertainment value and the appeal of the Web cam, especially because many of the sites are rather boring. With the drop in price and the increased ease of installation and use, more people are using Web cams to share the view from their part of the world. What motivates someone to do this? Why would someone want to see a stranger's home movies? In what type of Web cam Web site would you be interested? Why?

For more information on Web cams, visit the Discovering Computers 2002 Issues Web page (scsite.com/dc2002/issues.htm) and click Chapter 5 Issue #5.

Videoconferencing

A **videoconference** is a meeting between two or more geographically separated people who use a network or the Internet to transmit audio and video data (Figure 5-32). To participate in a videoconference, you need videoconferencing software along with a microphone, speakers, and a video camera attached to your computer. As you speak, members of the meeting hear your voice on their speakers. Any image in front of the video camera, such as a person's face, displays in a window on each participant's screen.

A **whiteboard** is another window on the screen that can display notes and drawings simultaneously on all participants' screens. This window provides multiple users with an area on which they can write or draw.



Figure 5-32 As you speak, members of a videoconference hear your voice on their speakers. With the video camera facing you, an image of your face displays in a window on each participant's screen.



Web cams are the Internet craze of today. Live Web cam images provide Web site visitors an inside view of your world. Setting up a Web cam is much easier than you might think.

1. The first step is to select a camera. If you use an analog camcorder, you need a card such as a video capture card that converts the analog video signal into a digital signal. Another alternative is a digital video camera that connects directly to your computer's USB port or parallel port. If the camera connects to the parallel port, you also will need a device such as a switchbox that enables you to use the camera and printer at the same time.

Be sure your camera can capture high-quality pictures for areas with poor lighting. A camera with an inadequate sensitivity to light often generates murky Web cam images. Many cameras are on the market, so be sure to read reviews prior to purchasing.

2. To display Web cam images on a Web page, you send the images from your camera to a Web server. With many Web cam software programs, you FTP images (frames) at specified times or time intervals. Some programs also allow you to set up streaming video from the camera. Popular Web cam software products include Webcam32 and Ispy WebCam (see URL below). Price range for this software is from \$25 to \$75.
3. Next, you create a Web page that will display your Web cam images. On the Web page, you need to add HTML code that instructs the Web server to display your images. Most Web cam software products provide sample code.
4. For the Web cam images to display on the Web, you need access to a Web server. Many ISPs or OSPs provide this service at no cost. With your Web page on the Web server, the world can see your Web cam images.

Several all-in-one kits also are available that supply the camera, the software, and sometimes access to a Web server. These kits are convenient and easy to use but may not provide the extras that are available when you purchase individual components.

For more information on Web cams and the Web addresses mentioned above, visit the Discovering Computers 2002 Apply It Web page (scsite.com/dc2002/apply.htm) and click Chapter 5 Apply It #2.

The costs of videoconferencing hardware and software continue to decrease. Thus, videoconferencing is becoming a cost-effective way to conduct business meetings, corporate training, and educational classes.

SCANNERS AND READING DEVICES

Some input devices save you time by eliminating the manual entry of data. With these devices, you do not type or speak into the computer. Instead, these devices capture data from a **source document**, which is the original form of the data. Examples of source documents are timecards, order forms, invoices, paychecks, advertisements, brochures, photographs, inventory tags, or any other document that contains data to be processed.

Devices that capture data directly from source documents include optical scanners, optical character recognition devices, optical mark recognition devices, bar code scanners, and magnetic-ink character recognition readers. The following pages discuss each of these devices.

Optical Scanner

An **optical scanner**, usually called a **scanner**, is a light-sensing input device that reads printed text and graphics and then translates the results into a form the computer can use.

One of the more popular types of scanners is a flatbed scanner. A

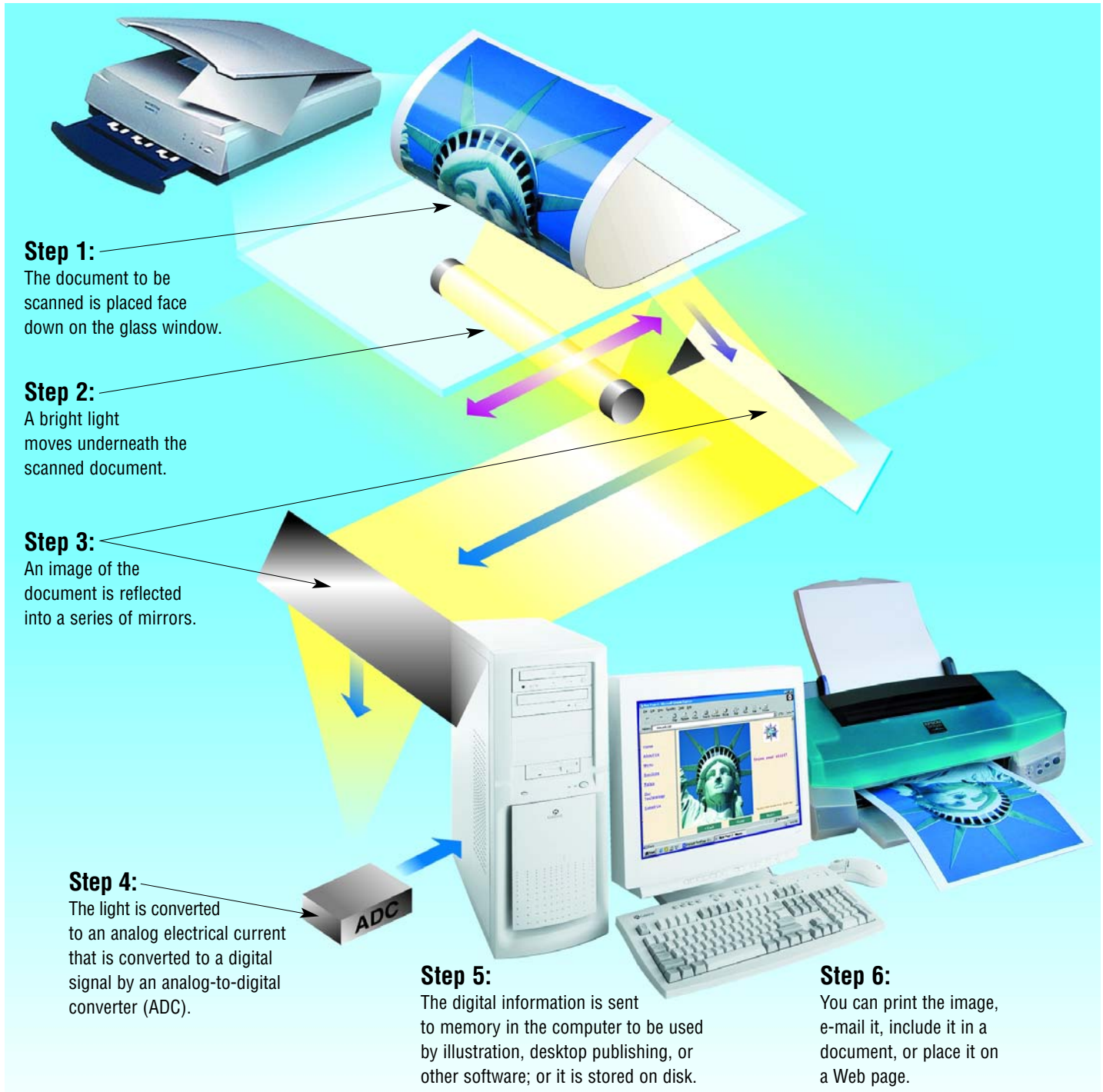
flatbed scanner works similarly to a copy machine except it creates a file of the document in memory instead of a paper copy (Figure 5-33). Once an object is scanned, you can display it on the screen, store it on a storage medium, print it, fax it, attach it to an e-mail message, include it in another document, or post it to a Web site or photo community for everyone to see.

For example, you can scan a picture and then include the picture when creating a brochure.

Web Link

For more information on scanners, visit the Discovering Computers 2002 Chapter 5 WEB LINK page (scsite.com/dc2002/ch5/weblink.htm) and click Scanners.

Figure 5-33 HOW A FLATBED SCANNER WORKS



Three other types of scanners are pen, sheet-fed, and drum. The table in Figure 5-34 summarizes the four types of scanners.

As with a digital camera, the quality of a scanner is measured by the number of bits it stores in a dot and the number of dots per inch, or resolution. The higher each number, the better quality, but the more expensive the scanner. Most of today's affordable color desktop scanners for the home or small business range from 30 to 48 bit and have an optical resolution ranging from 600 to 3,000 dpi. Commercial scanners designed for power users range from 4,000 to 12,500 dpi.

Businesses often use scanners for image processing. **Image**

processing, or **imaging**, consists of capturing, storing, analyzing, displaying, printing, and manipulating images. Image processing allows you to convert paper documents such as reports, memos, and procedure manuals into an electronic form. Once saved electronically, you can distribute these documents electronically.

Many business users store and index these documents with an image processing system. An **image processing system** is similar to an electronic filing cabinet that provides access to exact reproductions of the original documents. The government, for example, uses an image processing system to store property deeds and titles to provide quick access to the public, lawyers, and loan officers.

Many scanners also include OCR (optical character recognition) software. **OCR software** can read and convert many types of text documents. Suppose you need to modify a business report, but do not have the original word processing file. You could scan the document with a flatbed scanner, but you still would not be able to edit the report. The scanner, which does not differentiate between text and graphics, saves the report as an image. To convert the image into a text file that can be edited, you use OCR software that works with the scanner. You will be able to edit the resulting text file in a word processing program. The OCR software typically places any graphics in the scanned image into a separate graphics file.

TYPES OF SCANNERS

Scanner	Method of Scanning/ Use	Scannable Items
	• Similar to a copy machine • Scanning mechanism passes under the item to be scanned, which is placed on a glass surface	• Single sheet documents • Bound material • Photographs • Some models include trays for slides, transparencies, and negatives
	• Move pen over text to be scanned, then transfer data to computer • Ideal for mobile users, students, researchers • Some connect to a handheld computer • Some read Web bar codes	• Any printed text • Web bar codes
	• Item to be scanned is pulled into a stationary scanning mechanism • Smaller and less expensive than a flatbed scanner	• Single sheet documents • Photographs • Slides (with an adapter)
	• Item to be scanned rotates around a stationary scanning mechanism • Very large and expensive • Used in publishing industry	• Single sheet documents • Photographs • Slides • Negatives

Figure 5-34 This table describes the various types of scanners.

Optical Readers

Many companies use OCR characters on turnaround documents. A **turnaround document** is a document that you return (turn around) to the company that creates and sends it. For example, when you receive a bill, you tear off a portion of the bill and send it back to the company with your payment (Figure 5-36). The portion of the bill you return usually has your account number, payment amount, and other information printed in optical characters.

Bostongas
Essexgas Colonialgas
Eastern Enterprises

AUTO ***** 3-DIGIT 018
SCOTT GOOD
4934 WEST ST
IPSWICH MA 01938-2253

||.....||
BOSTON GAS COMPANY

MAKE CHECKS PAYABLE TO ABOVE
ACCOUNT NUMBER
02019 23730 910

03

PAYMENT DUE UPON RECEIPT
\$23.94

PLEASE DETACH HERE

SERVICE ADDRESS	ACCOUNT NUMBER	BILLING DATE
SCOTT GOOD 4934 WEST ST IPSWICH MA 01938-2253	02019 23730 910	AUG 7, 2002
	METER NUMBER	NEXT READ DATE
	09735042	SEP 5, 2002

FOR BILL INFORMATION OR SERVICE CALL: 1-617-469-2300

GAS USED
Bill for 1 month, Jul 6-Aug 4
Present actual meter read, Aug 4, 2002 0786
Previous actual meter read, Jul 6, 2002 -0786
Units of gas 0
Therm conversion factor x1.0550
Therms used this period 0

CHARGES FOR GAS USED
Commercial/Industrial, G-41

DELIVERY CHARGES:

GAS USE HISTORY

Therms		Therms	
Aug 02 Actual	0	Jan 02 Actual	27
Jul 02 Actual	0	Dec 01 Actual	3
Jun 02 Actual	1	Nov 01 Actual	7
May 02 Actual	4	Oct 01 Actual	0
Apr 02 Actual	9	Sep 01 Actual	0
Mar 02 Actual	43	Aug 01 Actual	0
Feb 02 Actual	180	Jul 01 Actual	0

BALANCE & PAYMENTS
Balance as of Jul 7, 2002 \$23.94

Annotations:
- "this portion is returned with payment" points to the top right section.
- "OCR characters indicate amount due" points to the account number and meter number fields.

Figure 5-36 OCR characters frequently are used with turnaround documents. With this bill, you tear off the top portion and return it with your payment.

OPTICAL MARK RECOGNITION

Optical mark recognition (OMR) devices read hand-drawn marks such as small circles or rectangles. A person places these marks on a form, such as a test, survey, or questionnaire answer sheet (Figure 5-37). With a test, the OMR device first reads the answer key sheet to record correct answers based on patterns of light. The OMR device then reads the remaining documents and matches their patterns of light against the answer key sheet.

BAR CODE SCANNER A **bar code scanner** uses laser beams to read bar codes (Figure 5-38). A **bar code** is an identification code that consists of a set of vertical lines and spaces of different widths. The bar code represents data that identifies the manufacturer and the item. Manufacturers either print a bar code on a product's package or on

School of Nursing

EVALUATION OF
TEACHING EFFECTIVENESS

Teaching effectiveness is the ability to help students achieve their highest level of independent thinking and clinical competency. It requires a blend of knowledge of the subject matter, interpersonal style, and flexibility in use of a variety of teaching methods.

Course #:

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Faculty ID #:

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

In my experience with this faculty member, I feel that he/she:

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Does Not Apply
1. Demonstrated confidence in his/her knowledge during a discussion, consultation, and/or in the practice setting.	☐	☐	☒	☐	☐	☐
2. Demonstrated clinical expertise.	☐	☒	☐	☐	☐	☐
3. Seemed knowledgeable in the content areas.	☐	☐	☒	☐	☐	☐
4. Helped me to develop my critical thinking and decision-making skills.	☐	☐	☒	☐	☐	☐
5. Stimulated my intellectual curiosity.	☐	☐	☒	☐	☐	☐
6. Used teaching methods appropriate to the size of the student group.	☐	☐	☐	☒	☐	☐
7. Asked thought-provoking questions.	☐	☐	☒	☐	☐	☐
8. Taught the course in an interesting manner.	☐	☒	☐	☐	☐	☐
9. Built on the knowledge and skills that I brought to the learning situation.	☐	☒	☐	☐	☐	☐
10. Explained ideas clearly.	☐	☒	☐	☐	☐	☐
11. Organized classroom content/practice experiences in a manner which was meaningful to me.	☐	☐	☒	☐	☐	☐
12. Was approachable.	☐	☐	☒	☐	☐	☐
13. Showed understanding and recognition of my individuality.	☐	☐	☐	☒	☐	☐
14. Respected students with differing points of view.	☐	☐	☐	☒	☐	☐
15. Was receptive to student feedback about the course during	☐	☐	☐	☒	☐	☐

Figure 5-37 On many surveys and questionnaires, you draw small circles to indicate your answers. These forms are read by optical mark recognition (OMR) devices.



Figure 5-38 A bar code scanner uses laser beams to read bar codes on products such as groceries, pharmacy supplies, vehicles, mail, books, magazines, and packages.

a label that is affixed to a product. A bar code scanner reads a bar code by using light patterns that pass through the bar code lines.

A variety of products such as groceries, pharmacy supplies, vehicles, mail, magazines, and books have bar codes. Each industry uses its own type of bar code. The U.S. Postal Service uses a POSTNET bar code. Retail and grocery stores use the Universal Product Code, or UPC (Figure 5-39). The table in Figure 5-40 summarizes some of the more widely used bar codes.



Figure 5-39 This UPC identifies a box of Kellogg's Froot Loops™.

TYPES OF BAR CODES

Bar Code Name	Sample Bar Code	Primary Market
Codabar		Libraries, blood banks, and air parcel carriers.
Code 39		Nonretail applications such as manufacturing, inventory, military, and health applications requiring numbers and letters in the bar code.
EAN – European Article Numbering		Similar to UPC, except used in Europe. A variation of EAN is used for ISBN numbers on books.
Interleaved 2 of 5		Nonretail applications, such as game tickets, requiring only numbers in the bar code.
POSTNET – Postal Numeric Encoding Technique		U.S. Postal Service to represent a postal code or delivery point code.
UPC – Universal Product Code		Supermarkets, convenience, and specialty stores used to identify manufacturers and products.
Web bar code		Magazines and books to display a Web page.

Figure 5-40 Some of the more widely used types of bar codes.

Some books and magazines have Web bar codes throughout their pages. When you scan a **Web bar code** with a handheld scanner, the Web page associated with the bar code displays on your computer screen.



Web Bar Codes Can Save You Time

You are reading the daily news and run across a Web address that looks interesting. You write it down so you can type it later into your browser and review the site. But what if you did not have to type in the Web site address? If you live in Charleston, South Carolina and subscribe to one of the daily newspapers, you may have noticed bar codes displayed throughout the pages. Use a handheld scanner connected to your computer, run it across the bar code, and a related Web page pops up on the screen. This technology is not limited to newspapers. It has been extended to magazines, books, postcards, or any imaginable object where one might want to establish a direct connection between static objects and the Internet.

A related technology is the digital watermark. Consider the way a photograph is produced. Before the page is printed, the watermark is applied to the electronic version of the photograph. Run your scanner across the photograph or hold the photograph in front of a PC camera and up pops a related Web page. Look for this technology in magazines such as *Wired* and *Popular Mechanics*.

For more information on Web bar codes and digital watermarks, visit the Discovering Computers 2002 Apply It Web page (scsite.com/dc2002/apply.htm) and click Chapter 5 Apply It #3.

Magnetic Ink Character Recognition Reader

A **magnetic-ink character recognition (MICR) reader** can read text printed with magnetized ink. The banking industry almost exclusively uses MICR for check processing. Each check in your checkbook has pre-coded MICR characters on the lower-left edge (Figure 5-41). These characters represent the bank number, your account number, and the check number.

When a bank receives a check for payment, it uses an MICR inscriber to print the amount of the check in MICR characters in the lower-right corner. The check then

is sorted or routed to the customer's bank, along with thousands of others. Each check is inserted into an MICR reader, which sends the check information — including the amount of the check — to a computer for processing. When you balance your checkbook, verify the amount printed in the lower-right corner is the same as the amount written on the check; otherwise, your statement will not balance.

The banking industry has established an international standard not only for bank numbers, but also for the font of the MICR characters. This standardization makes it possible for you to write checks in another country.

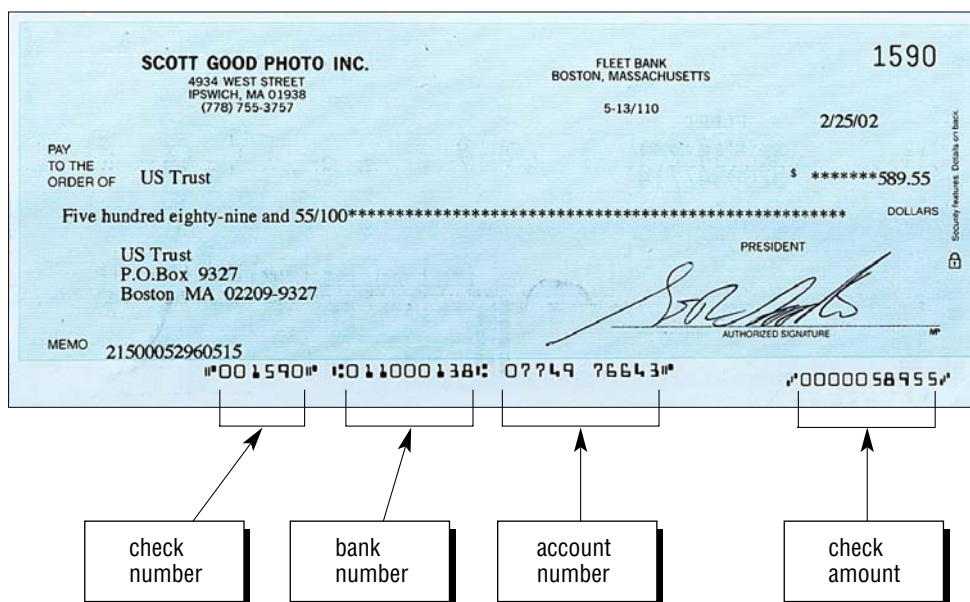


Figure 5-41 The MICR characters preprinted on the check represent the bank number, your account number, and the check number. The amount of the check in the lower-right corner is added after the check is cashed.

Wireless Input

Instead of reading or scanning data from a source document, you can use a wireless input technology to obtain data directly at the location where the transaction or event takes place. Factories, warehouses, the outdoors, or other locations where heat, humidity, and cleanliness are difficult to control use wireless input. The employee uses a handheld computer or device to collect data wirelessly.

As shown in Figure 5-42, an employee can enter product inventory data into a handheld device and then later transfer the data to a desktop computer through a docking station.

Many users have Web-enabled computers and devices such as cellular telephones and pagers, which allow wireless connections to the Web. More and more users today send data wirelessly to central office computers using these devices.

INPUT DEVICES FOR PHYSICALLY CHALLENGED USERS

The growing presence of computers in everyone's lives has generated an awareness of the need to address computing requirements for those with physical limitations. The **Americans with Disabilities Act (ADA)** requires any company with 15 or more employees make reasonable attempts to accommodate the needs of physically challenged workers. Whether at work or at home, you may find it necessary to obtain input devices that address physical limitations. Besides voice recognition, which is ideal for blind or visually impaired users, several other input devices are available.

Users with limited hand mobility that wish to use a keyboard have several options. A **keyguard** is a metal or plastic plate placed over the keyboard that allows users to rest their hands on the keyboard without accidentally pressing any keys. A keyguard also guides a finger or pointing device so a user presses only one key at a time (Figure 5-43).



Figure 5-42 This employee enters product data into a handheld device and then later transfers the data to a desktop computer through a docking station.



Figure 5-43 A keyguard allows users to rest their hands on the keyboard without accidentally pressing any keys. It also guides a finger or pointing device onto a key so a user presses only a single key at a time.

Keyboards with larger keys also are available. Still another option is the **on-screen keyboard**, in which a graphic of a standard keyboard displays on the user's screen. Figure 5-44 shows an on-screen keyboard in Microsoft Word. In Figure 5-45, a woman uses a pointing device in her lap to press the keys on the on-screen keyboard.

Various pointing devices are available for users with motor disabilities. Small trackballs that you control with a thumb or one finger can be attached to a table, mounted to a wheelchair, or held in a user's hand. People with limited hand movement can use a **head-mounted pointer** to control the pointer or insertion point. To simulate the functions of a mouse button, a user can work with switches that control the pointer. The switch

might be a pad you press with your hand, a foot pedal, a receptor that detects facial motions, or a pneumatic instrument controlled by puffs of air.

Two exciting developments in this area are gesture recognition and computerized implant devices. Both in the prototype stage, they attempt to provide users with a natural computer interface. With **gesture recognition**, the computer will be able to detect human motions. Computers with this capability have the potential to recognize sign language, read lips, track facial movements, or follow eye gazes. For paralyzed or speech impaired individuals, a doctor will implant a computerized device into the brain. This device will contain a transmitter. As the user thinks thoughts, the transmitter will send signals to the computer.

PUTTING IT ALL TOGETHER

When you purchase a computer, you should have an understanding of the input devices included with the computer, as well as those you may need that are not included. Many factors influence the type of input devices you may use: the type of input desired, the hardware and software in use, and the desired cost. The type of input devices you require depends on your intended use. Figure 5-46 outlines several suggested input devices for specific computer users.

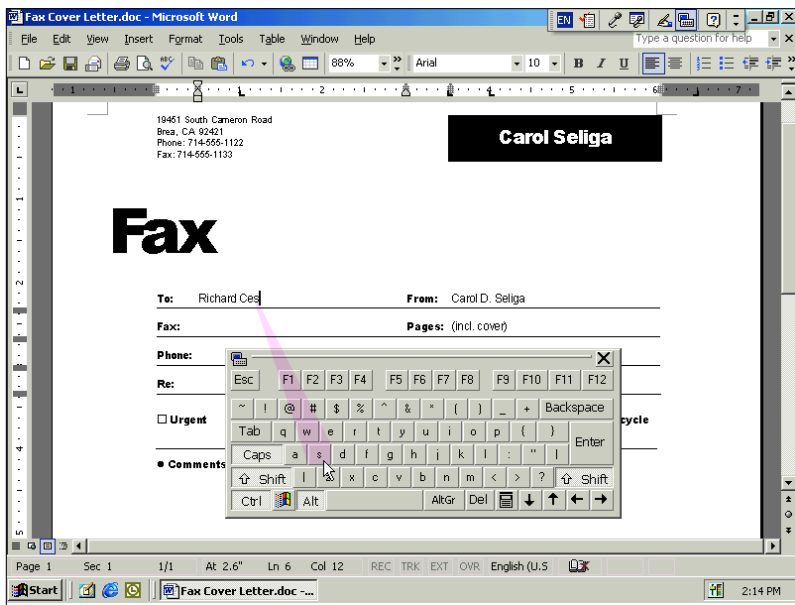


Figure 5-44 As you click letters on the on-screen keyboard, they display in the document at the location of the insertion point.

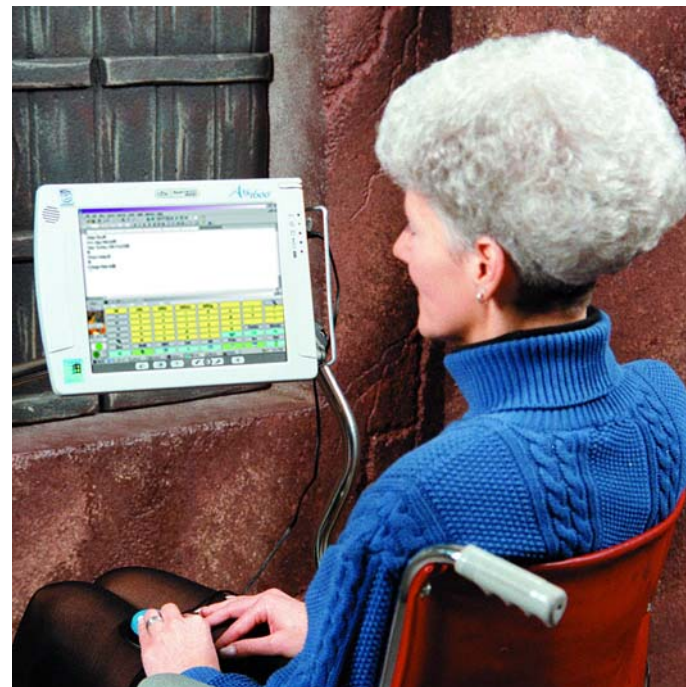


Figure 5-45 By operating a handheld switch, this user selects keyboard keys that display on the screen of this portable computer, which is mounted to her wheelchair.

SUGGESTED INPUT DEVICES BY USER

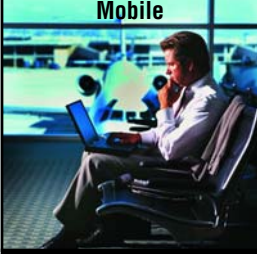
USER	INPUT DEVICE
 Home	- Enhanced keyboard or ergonomic keyboard - Mouse - Joystick or wheel 30-bit 600 x 1,200 dpi color scanner 1- or 2-megapixel digital camera - Microphone - Voice recognition software - PC video camera
 Small Office/Home Office	- Enhanced keyboard or ergonomic keyboard - Mouse - Stylus and portable keyboard for handheld computer 36-bit 600 x 1,200 dpi color scanner 1- or 2-megapixel digital camera - Microphone - Voice recognition software - PC video camera
 Mobile	- Wireless mouse for notebook computer - Trackball, touchpad, or pointing stick on notebook computer - Stylus and portable keyboard for handheld computer 2- or 3-megapixel digital camera - Voice recognition software
 Large Business	- Enhanced keyboard or ergonomic keyboard - Mouse - Touch screen - Light pen for point-of-sale terminals 42-bit 1,200 x 1,200 dpi color scanner - OCR or OMR or bar code reader or MICR reader - Microphone - Voice recognition software - Video camera for videoconferences
 Power	- Enhanced keyboard or ergonomic keyboard - Mouse - Stylus and cursor for graphics tablet 48-bit 1,200 x 1,200 dpi color scanner 3-megapixel digital camera - Microphone - PC video camera

Figure 5-46 This table recommends suggested input devices.



Webcasting

Webcasting is a form of communications that features streaming rich media, including audio, video, and Web-based multimedia. It quickly is becoming a mainstream Internet application. Similar to a television broadcast, a Webcast airs exclusively on the Internet. The advantage is Webcasting can be done at anytime, anywhere in the world.

With broadband communications becoming more widely used, digital video and digital audio quickly are becoming in-demand technologies. As a result, Webcasting is a growing niche industry. Because creating and delivering a Webcast requires diverse skills, employment opportunities are available for people with knowledge in a range of fields, including production and camera use, content development and technical writing, audio/visual expertise, engineering, networking, or other technical areas. Dual skill sets are an asset. Salaries within this industry vary widely, anywhere from \$25,000 to \$100,000 or more, depending on the job and the skills.

Currently no certifications are available in this field, but you can look for these in the near future. The International Webmasters Association (IWA) will most likely sponsor the certifications (see URL below).

To learn more about Webcasting as a career and the Web site mentioned above, visit the Discovering Computers 2002 Careers Web page (scsite.com/dc2002/careers.htm) and click Webcasting.

E-COMMUNITIES

PICTURE THIS!

Share Your Community Pride

The family welcomes a new baby, a cousin graduates from college, good friends tie the knot, and grandma and grandpa celebrate their 50th wedding anniversary. Share these kinds of announcements, memories, and activities, and photographs of each event, by joining a Web community or creating your own. Virtual communities allow family, friends, and others with similar interests to connect and disseminate information with the Internet world.

Web communities connect computer users around the globe and make exchanging ideas and viewpoints easy and convenient. Thousands of virtual communities permit groups to play games, offer support, entertain each other, and work on collective projects.

Several Web sites bridge the gap between conventional and digital photography. These photo-sharing services allow shutterbugs to create virtual photo albums and share these images online.

Most Web sites, such as Zing shown in Figure 5-47, provide free, unlimited storage space with the hope that users will view the advertisements and order paper reprints and personalized gifts. Other photo Web sites are listed in Figure 5-48.

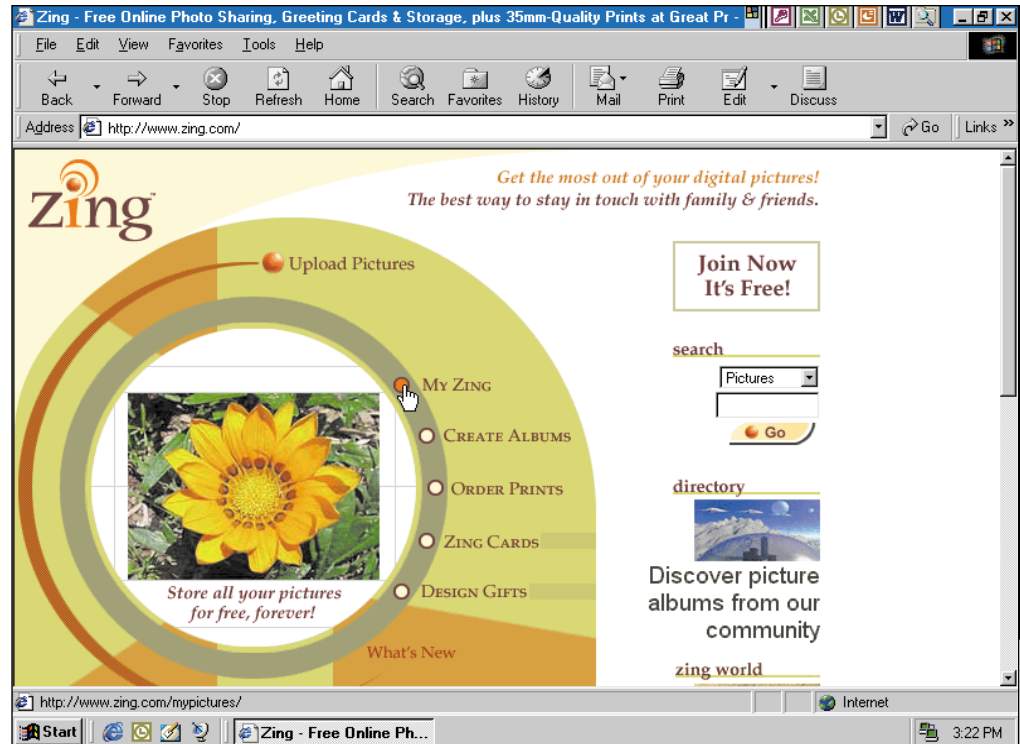


Figure 5-47 Zing and other photo Web sites provide a setting where family and friends can view digital pictures online.

PHOTO AND COMMUNITY WEB SITES URL	
Photos	
GatherRound.com™	gatherround.com
Kodak PhotoNet Online	www.photonet.com
MSN PictureIt Photo Center	communities.msn.com/photoalbums
PhotoWorks	photoworks.com
Shutterfly	shutterfly.com
Zing	zing.com
Web Communities	
Canterbury Net	www.canterbury.net.nz
CyberErie	cybererie.com
MSN Web Communities	communities.msn.com/webcommunities
Redstone Colorado Online	redstonecolorado.com
Run the Planet	runthepianet.com
Yahoo! GeoCities Neighborhoods	geocities.yahoo.com/cgi-bin/hood/geo
For an updated list of photo and community Web sites, visit scsite.com/dc2002/e-rev.htm .	

Figure 5-48 These photo and community Web sites allow you to share your pictures and meet people with similar interests.

Another type of virtual community allows people with related interests to share information. The categories of these Web communities are wide-ranging and include health support groups and vintage Corvettes to cruise ships and the Chicago Cubs. The Yahoo! GeoCities CollegePark community displayed in Figure 5-49 allows users to converse on such topics as distance learning, sports, and music. Runners can jump to Run the Planet, billed as the largest world-wide running community on the Internet.

Residents in entire towns have developed Web communities that promote businesses, permit parents to communicate with teachers, and inform citizens about the town council's meetings. One of the first communities was developed in Montana in the late 1980s to connect teachers, many of whom taught in one-room schools. Today, residents throughout the world have virtual communities. Citizens in Canterbury, New Zealand, for example, share information on genealogy, psychology, and community activities on their Canterbury Net; Redstone, Colorado, residents share community news and activities by logging on to Redstone Colorado Online (Figure 5-50); and CyberErie citizens in Erie, Pennsylvania, take coffee breaks in their cyber café, share their pets in the virtual zoo, and relax in the CyberLibrary.

For more information on Web communities, visit the Discovering Computers 2002 E-Revolution Web page (scsite.com/dc2002/e-rev.htm) and click Communities.

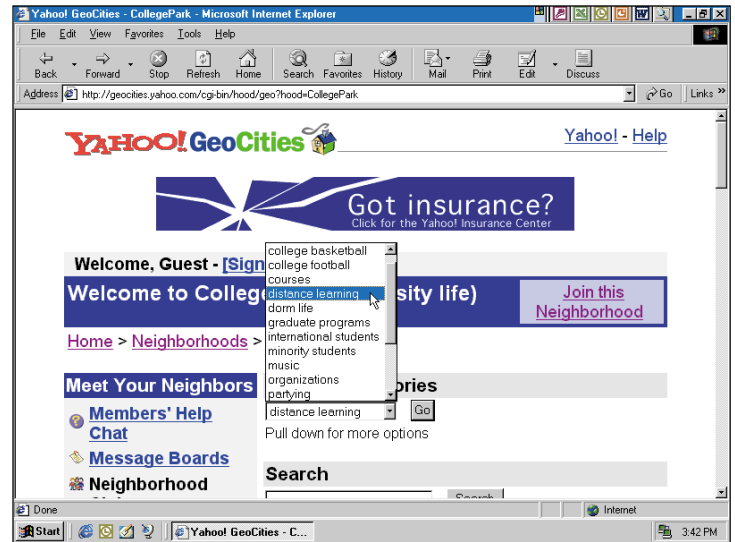


Figure 5-49 Cyber residents of Yahoo!s GeoCities CollegePark discuss hundreds of collegiate topics, including distance learning, assignments, sports, and activities.

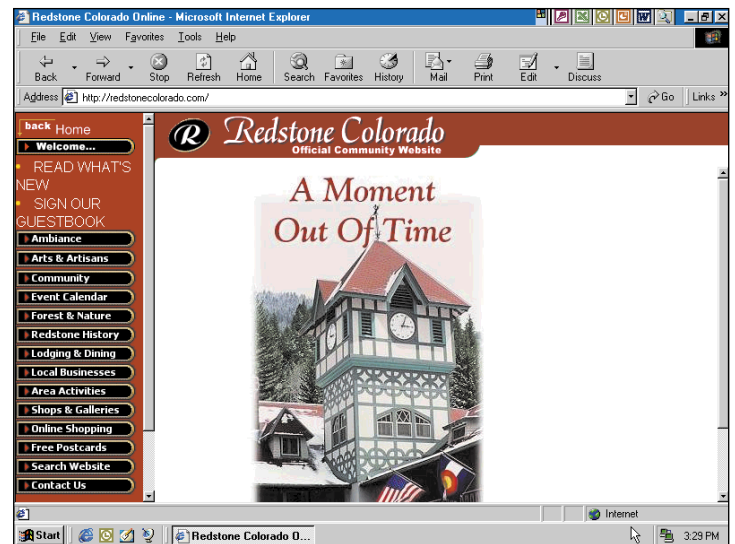


Figure 5-50 Redstone, Colorado, residents share information on local events, shopping, and the environment through their community Web site.



E-COMMUNITIES

applied:

1. View three of the photos Web sites listed in Figure 5-48. Make a table that lists the Web site names, categories of photo albums, amount of storage space, cost, resolution constraints, and length of time photos are permitted to stay online. Explain why you would or would not like to view photos online.
2. Visit two of the community Web sites listed in Figure 5-48. Write a paragraph on each Web site describing its content, ease of use, and features. Then, describe what content you would include in a Web community of your hometown. Would you, for example, include a Web cam? A list of businesses and services? Hours when public offices are open? What advertisers, if any, would you contact to obtain revenue?

In Summary



Web Instructions: To display this page from the Web, start your browser and enter the URL scs.site.com/dc2002/ch5/summary.htm. Click the links for current and additional information. To listen to an audio version of this In Summary, click the Audio button. To play the audio RealPlayer must be installed on your computer (download by clicking [here](#)).

1

What Are the Two Types of Input?

Input is any data or instructions entered into the memory of a computer. The two types of **input** are data and programs. **Data** is a collection of unorganized facts that can include words, numbers, pictures, sounds, and video. A computer processes data into information. A **program** is a series of instructions that tell a computer how to process data into information.

2

What Are the Characteristics of a Keyboard?

The **keyboard**, a primary input device on a computer, is an input device that contains keys you press to enter data into the computer. All keyboards have a typing area used to type letters of the alphabet, numbers, punctuation marks, and other basic characters. A **keyboard** also may include a **numeric keypad** designed to make it easier to enter numbers, **function keys** programmed to issue commands and accomplish certain tasks, **arrow keys** used to move the **insertion point**, and **toggle keys** that can be switched between two different states.

3

Describe the Various Types of Keyboards

A standard computer keyboard sometimes is called a **QWERTY keyboard** because of the layout of its typing area. An **enhanced keyboard** has function keys, CTRL keys, ALT keys, and a set of arrow and additional keys. A **cordless keyboard** transmits data using wireless technology such as infrared light or radio waves. A **portable keyboard** is a full-sized keyboard you can attach and remove from a handheld computer. An **ergonomic keyboard** is designed to reduce the risk of wrist injuries.

4

What Are the Various Types of Pointing Devices?

A **pointing device** controls the movement of a pointer on the screen. A **mouse** is a pointing device that is moved across a flat surface, controls the movement of the pointer on the screen, and is used to make selections from the screen. A **trackball** is a stationary pointing device with a ball mechanism on its top. A **touchpad** or **trackpad** is a flat, rectangular pointing device that is sensitive to pressure and motion. A **pointing stick** is a pressure-sensitive pointing device shaped like a pencil eraser. Other pointing devices include a **joystick** (a vertical lever mounted on a base), a **wheel** (a steering-wheel type of device), a **light pen** (a handheld device that contains a light source or can detect light), a **touch screen** (a monitor with a touch-sensitive panel on the screen), a **stylus** or **pen** (a pen to write text and draw lines), a **graphics tablet** or **digitizer** or **digitizing tablet** (an electronic plastic board used to input graphical data) and a **cursor** (a mouse-like device that has a window with cross hairs).

5

How Does a Mouse Work?

The bottom of a **mouse** is flat and contains a multidirectional mechanism, either a small ball or an optical sensor, which detects movement of the mouse. As the mouse is moved across a flat surface, electronic circuits in the mouse translate the movement into signals that are sent to the computer. You use the mouse to move the pointer on the screen. To operate the mouse, you point, click, right-click, double-click, drag, and right-drag.

6

What Are the Different Mouse Types?

A **mechanical mouse** has a rubber or metal ball on its underside. An **optical mouse** uses devices that emit light to detect the mouse's movement. A **cordless mouse**, or **wireless mouse**, relies on battery power and uses infrared light or radio waves to communicate with a receiver.

In Summary

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features ■ TIMELINE 2002 ■ WWW & E-SKILLS ■ MULTIMEDIA ■ BUYER'S GUIDE 2002 ■ WIRELESS TECHNOLOGY ■ TRENDS 2002 ■ INTERACTIVE LABS ■ TECH NEWS

7

How Does Voice Recognition Work?

Voice input is the process of entering data by speaking into a computer-attached microphone and is part of a larger category of input called audio input. **Audio input** is the process of entering any sound into the computer such as speech, music, and sound effects. To input voice requires **voice recognition** or **speech recognition** software. The program may be **speaker-dependent** (the computer makes a profile of your voice) or **speaker-independent** (contains a built-in set of word patterns). Some programs require **discrete speech**, which means you have to speak slowly, whereas others support **continuous speech**, allowing you to talk in a normal conversational tone.

8

How Is Data Input into a Handheld Computer?

Handheld computers are popular for both home and business users. Using the stylus, the primary input method, you can enter data through an onscreen keyboard or use handwriting recognition software. Other input methods include attaching a full-sized keyboard, using voice input, or attaching a digital camera to the handheld computer.

9

What Are the Uses of a Digital Camera?

You use a **digital camera** to take pictures and digitally store the photographed images. The three basic types are **studio camera**, **field camera**, and **point-and-shoot camera**. You can **download**, or transfer, the photographed images to a computer by a connecting cable; or they can be stored and copied on a computer. Once on a computer, pictures can be edited with photo-editing software, printed, faxed, sent via electronic mail, included in another document, or posted on a Web site.

10

What Are Various Techniques Used for Video Input?

Video input or **video capture** is the process of entering a full-motion recording into a computer and storing the video on a hard disk or some other medium. To

capture video, a video camera is plugged into a **video capture card**, which is an expansion card that converts the analog video signal into a digital signal. A **digital video (DV) camera** is a video camera that records video as digital signals, instead of analog signals. A **video digitizer** can be used to capture an individual frame from a video and save the still picture in a file.

11

What Are Uses of PC Video Cameras and Web Cams?

A **PC video camera**, or **PC camera**, is a DV camera that allows the home user to record, edit, and capture video and still images and to make video telephone calls on the Internet. You can use the PC camera for security by setting it to take digital photographs at preset times. To attract visitors to your Web site, use your video camera to display a **Web cam** image on your Web page.

12

How Do Scanners and Other Reading Devices Work?

A **scanner** is a light-sensing input device that reads printed text and graphics and then translates the results into a form the computer can use. An **optical reader** uses a light source to read characters, marks, and codes and converts them into digital data that can be processed by a computer. Three types of **optical readers** are **optical character recognition (OCR)**, **optical mark recognition (OMR)**, **bar code scanners**, and **magnetic-ink character recognition (MICR) reader**.

13

What Are Some Alternative Input Devices for Physically Challenged Users?

Speech recognition, or the computer's capability of distinguishing spoken words, is ideal for blind or visually impaired computer users. A **keyguard**, which is placed over the keyboard, allows people with limited hand mobility to rest their hands on the keyboard and guides a finger or pointing device so a user presses only one key at a time. Keyboards with larger keys and screen-displayed keyboards on which keys are pressed using a pointing device also can help. Pointing devices such as small trackballs that can be controlled with a thumb or one finger and **head-mounted pointers** also are available for [users with motor disabilities](#).

Key Terms

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features ■ **TIMELINE 2002** ■ **WWW & E-SKILLS** ■ **MULTIMEDIA** ■ **BUYER'S GUIDE 2002** ■ **WIRELESS TECHNOLOGY** ■ **TRENDS 2002** ■ **INTERACTIVE LABS** ■ **TECH NEWS**

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch5/terms.htm. Scroll through the list of terms. Click a term to display its definition and a picture. Click the To WEB button for current and additional information about the term from the Web. To see animations, Shockwave and Flash Player must be installed on your computer (download by clicking [here](#)).

Americans with Disabilities Act
(ADA) (5.31)

arrow keys (5.4)

audio input (5.16)

bar code (5.28)

bar code scanner (5.28)

cam (5.23)

command (5.3)

continuous speech (5.15)

cordless keyboard (5.5)

cordless mouse (5.8)

cursor (5.13)

data (5.3)

digital camera (5.18)

digital video (DV) camera (5.21)

digital watermark (5.22)

digitizer (5.13)

digitizing tablet (5.13)

discrete speech (5.15)

dots per inch (dpi) (5.20)

download (5.18)

electronic signatures (5.13)

enhanced keyboard (5.5)

enhanced resolution (5.20)

ergonomic keyboard (5.6)

ergonomics (5.6)

e-signatures (5.13)

field camera (5.19)

flatbed scanner (5.25)

function keys (5.4)

gesture recognition (5.32)

graphical user interface (GUI) (5.3)

graphics tablet (5.13)

handwriting recognition software
(5.14)

head-mounted pointer (5.32)

image processing (5.26)

image processing system (5.26)

imaging (5.26)

information (5.3)

input (5.2)

input device (5.4)

insertion point (5.4)

instructions (5.3)

interpolated resolution (5.20)

joystick (5.11)

keyboard (5.4)

keyguard (5.31)

light pen (5.12)

magnetic-ink character recognition

(MICR) reader (5.30)

mechanical mouse (5.7)

menu-driven (5.3)

mouse (5.7)

mouse pad (5.7)

mouse pointer (5.7)

numeric keypad (5.4)

OCR devices (5.27)

OCR software (5.26)

on-screen keyboard (5.32)

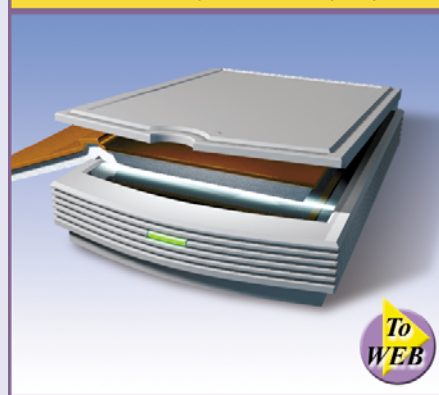
optical character recognition (OCR)
(5.27)

optical mark recognition (OMR) (5.28)

optical mouse (5.7)

SCANNER

Light-sensing input device that reads printed text and graphics, then translates the results into a form the computer can use; similar to a copy machine except it creates a file of the document instead of a paper copy. Also called an optical scanner. (5.25)



optical reader (5.27)

optical resolution (5.20)

optical scanner (5.25)

PC camera (5.22)

PC video camera (5.22)

pen (5.13)

pixel (5.20)

point-and-shoot camera (5.19)

pointer (5.7)

pointing device (5.7)

pointing stick (5.11)

portable keyboard (5.6)

program (5.3)

QWERTY keyboard (5.5)

resolution (5.20)

scanner (5.25)

source document (5.24)

speaker-dependent software (5.14)

speaker-independent software (5.15)

speech recognition (5.14)

streaming cam (5.23)

studio camera (5.19)

stylus (5.13)

toggle key (5.4)

touch screen (5.12)

touchpad (5.10)

trackball (5.10)

trackpad (5.10)

turnaround document (5.27)

user response (5.3)

video capture (5.21)

video capture card (5.21)

video compression (5.21)

video decoder (5.21)

video digitizer (5.21)

video input (5.21)

video telephone call (5.22)

videoconference (5.24)

voice input (5.14)

voice recognition (5.14)

WAV (5.16)

waveforms (5.16)

Web bar code (5.30)

Web cam (5.23)

wheel (5.11)

whiteboard (5.24)

wireless mouse (5.8)

Learn It Online

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features

TIMELINE 2002

WWW & E-SKILLS

MULTIMEDIA

BUYER'S GUIDE 2002

WIRELESS TECHNOLOGY

TRENDS 2002

INTERACTIVE LABS

TECH NEWS

Web Instructions: To display this page from the Web, start your browser and enter the URL scs.site.com/dc2002/ch5/learn.htm.

1. Web Guide

Click [Web Guide](#) to display the Guide to World Wide Web Sites and Searching Techniques Web page. Click Reference and then click About.com. Search for data dictionary. In the Find It Now text box, type digital camera. Scroll through the results and then click a link of your choice. Use your word processing program to prepare a brief report on your findings and submit your assignment to your instructor.

2. Scavenger Hunt

Click [Scavenger Hunt](#). Print a copy of the Scavenger Hunt page; use this page to write down your answers as you search the Web. Submit your completed page to your instructor.

3. Who Wants to Be a Computer Genius?

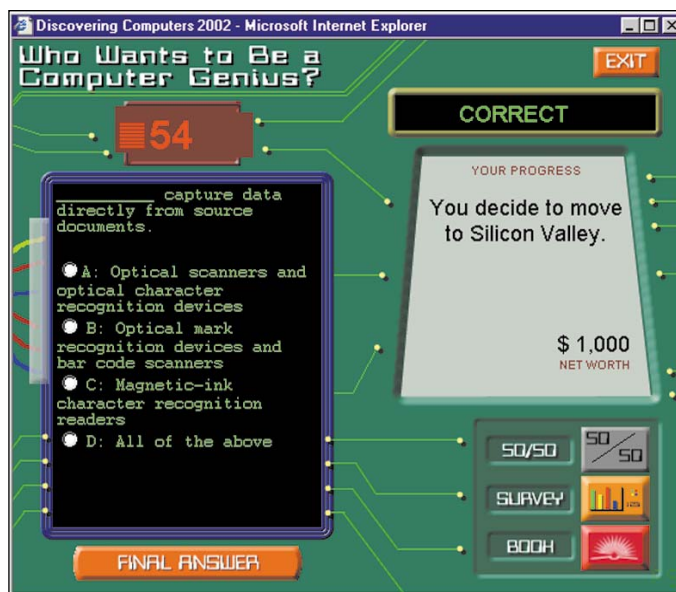
Click [Computer Genius](#) to find out if you are a computer genius. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit your score to your instructor.

4. Wheel of Terms

Click [Wheel of Terms](#) to reinforce important terms you learned in this chapter by playing the Shelly Cashman Series version of this popular game. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit your score to your instructor.

5. Career Corner

Click [Career Corner](#) to display the Career Magazine page. Review this page. Click the links that you find interesting. Write a brief report on the topics you found to be the most interesting. Submit the report to your instructor.



6. Search Sleuth

Click [Search Sleuth](#) to learn search techniques that will help make you a research expert. Submit the completed assignment to your instructor.

7. Crossword Puzzle Challenge

Click [Crossword Puzzle Challenge](#). Complete the puzzle to reinforce skills you learned in this chapter. Directions on how to play the game will display. When you are ready to play, click the PLAY button. Submit the completed puzzle to your instructor.

8. Practice Test

Click [Practice Test](#). Answer each question. When completed, click the Grade Test button to submit the quiz for grading. Make a note of any missed questions. If required, print a copy to submit to your instructor.



Checkpoint

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features

■ TIMELINE 2002

■ WWW & E-SKILLS

■ MULTIMEDIA

■ BUYER'S GUIDE 2002

■ WIRELESS TECHNOLOGY

■ TRENDS 2002

■ INTERACTIVE LABS

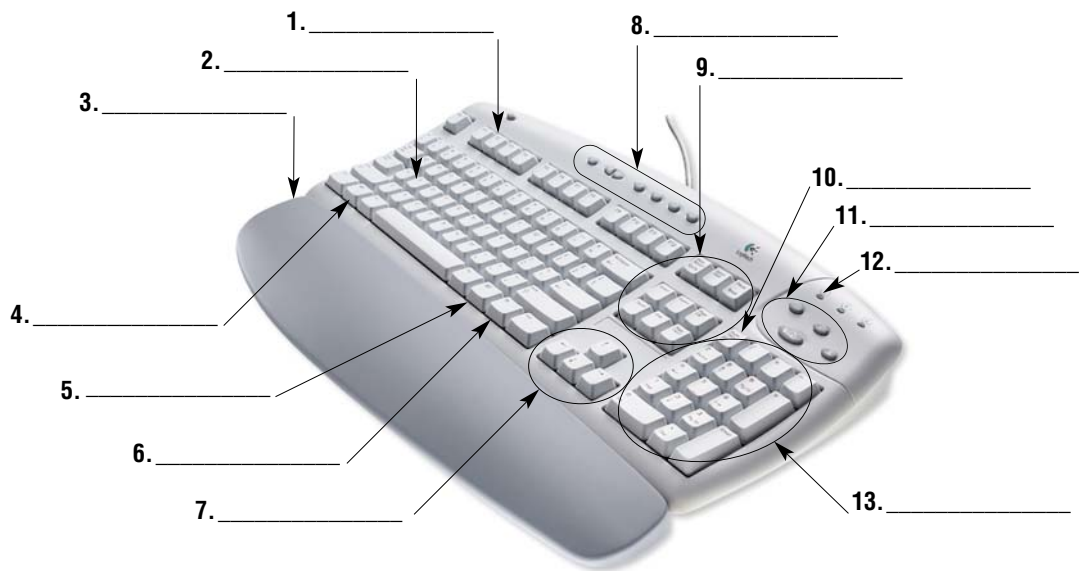
■ TECH NEWS

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch5/check.htm. Click the links for current and additional information. To experience the animation and interactivity, Shockwave and Flash Player must be installed on your computer (download by clicking [here](#).)



LABEL THE FIGURE

Instructions: Identify these areas and keys on a typical desktop computer keyboard.



MATCHING

Instructions: Match each term from the column on the left with the best description from the column on the right.

- _____ 1. Trackball
- _____ 2. Pointing stick
- _____ 3. Joystick
- _____ 4. Mouse
- _____ 5. Touchpad

- a. The most widely used pointing device on desktop computers.
- b. A stationary pointing device with a ball on its top.
- c. A vertical lever mounted on a base.
- d. A steering-wheel type input device.
- e. A handheld input device that contains a light source.
- f. A small, flat, rectangular pointing device that is sensitive to pressure and motion.
- g. A pressure-sensitive pointing device shaped like a pencil eraser that is positioned between keys on the keyboard.

Checkpoint

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features ■ TIMELINE 2002 ■ WWW & E-SKILLS ■ MULTIMEDIA ■ BUYER'S GUIDE 2002 ■ WIRELESS TECHNOLOGY ■ TRENDS 2002 ■ INTERACTIVE LABS ■ TECH NEWS



MULTIPLE CHOICE

Instructions: Select the letter of the correct answer for each of the following questions.

1. A(n) _____ is a device that looks similar to a mouse, except it has a window with cross hairs, so the user can see through to the [tablet](#).
a. optical scanner
b. cursor
c. stylus
d. trackball
2. _____ is speaking slowly and pausing between each word when using [voice recognition](#) software.
a. Discrete speech
b. Continuous speech
c. Speaker-independent
d. Speaker-dependent
3. An architect may use an [electronic pen](#) and a _____ to create drawings.
a. graphics tablet
c. touchpad
b. touch screen
d. trackball
4. The most expensive type of [digital camera](#) is a _____.
a. field
b. point-and-shoot
c. studio
d. Web cam
5. A [light-sensing input device](#) that reads printed text and graphics and then translates the results into a form the computer can use is called a _____.
a. camera
b. microphone
c. handheld computer
d. scanner



SHORT ANSWER

Instructions: Write a brief answer to each of the following questions.

1. Why is [resolution](#) important when using a scanner? _____ How is resolution typically measured and stated? _____
2. How is [optical character](#) recognition different from optical mark recognition? _____ What is MICR? _____
3. What is a [bar code](#)? _____ How are bar codes read? _____ On what products are they used? _____ What is the difference between a bar code and a Web bar code? _____
4. How is speaker-dependent software different from [speaker-independent software](#)? _____ How is discrete speech recognition different from continuous speech recognition? _____
5. What is videoconferencing? _____ How does a [whiteboard](#) enhance videoconferencing? _____ What hardware is required for a videoconference? _____



WORKING TOGETHER

Instructions: Working with a group of your classmates, complete the following team exercise.

The Occupational and Safety Health Association (OSHA) defines ergonomics as the science of fitting the job to the worker. Investigate the difference between [carpal tunnel syndrome](#) and repetitive strain injury. Prepare a report and a PowerPoint presentation to share with the class. Include suggestions on proper workstation ergonomics.

In The Lab

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features ■ **TIMELINE 2002** ■ **WWW & E-SKILLS** ■ **MULTIMEDIA** ■ **BUYER'S GUIDE 2002** ■ **WIRELESS TECHNOLOGY** ■ **TRENDS 2002** ■ **INTERACTIVE LABS** ■ **TECH NEWS**

Web Instructions: To display this page from the Web, start your browser and enter the URL scsite.com/dc2002/ch5/lab.htm. Click the links or current and additional information.

About Your Computer



This exercise uses Window 95 or Windows 98 procedures. Your computer probably has more than one input device. To learn about the input devices on your computer, right-click the My Computer icon on the desktop. Click [Properties](#) on the shortcut menu. When the System Properties dialog box displays, click the Device Manager tab. Click View devices by type. Below Computer, a list of hardware device categories displays. What input devices appear in the list? Click the plus sign next to each category. What specific input devices in each category are connected to your computer? Click the Cancel button in the System Properties dialog box.



Customizing the Keyboard

The Windows operating system provides several ways to customize the keyboard for people with physical limitations. Some of these options are StickyKeys, FilterKeys, and [ToggleKeys](#). To discover more about each option, click the Start button on the taskbar, point to Settings on the Start menu, and then click Control Panel on the Settings submenu. Double-click the Accessibility Options icon in the Control Panel window. Click the Keyboard tab in the Accessibility Properties dialog box. Click the Question Mark button in the title bar,

click StickyKeys, read the information on the pop-up window, and then click the pop-up window to close it. Repeat this process for FilterKeys and ToggleKeys. What is the purpose of each option? How might each option benefit someone with a physical disability? Click the Cancel button in the Accessibility Properties dialog box and then click the Close button in the Control Panel window.

Using the Mouse and Keyboard to Interact with an Online Program



See your instructor for the location of the Loan Payment Calculator program. Click the Start button on the [taskbar](#), and then click Run on the Start menu to display the Run dialog box. In the Run text box, type the path and file name of the program. For example, type `a:\loancalc.exe` and then press the ENTER key to display the Loan Payment Calculator window. Type 12500 in the LOAN AMOUNT text box. Click the YEARS right scroll arrow or drag the scroll box until YEARS equals 15. Click the APR right scroll arrow or drag the scroll box until APR equals 8.5. Click the Calculate button. Write down the monthly payment and sum of payments. Click the Clear button. What are the monthly payment and sum of payments for each of these loan amounts, years, and APRs: (1) 28000, 5, 7.25; (2) 98750, 30, 9; (3) 6000, 3,

8.75; (4) 62500, 15, 9.25. Close the Loan Payment Calculator.



MouseKeys

A [graphical user interface](#) allows you to perform many tasks with just the point and click of a mouse. Yet, what if you do not have, or cannot use, a mouse? The Windows operating system is prepared to accommodate this possibility with an option called MouseKeys. When the MouseKeys option is turned on, you can use numeric keypad keys to move the mouse pointer, click, right-click, double-click, and drag. To find out how, click the Start button on the taskbar and then click Help on the Start menu. Click the Index tab in the Help window. Type MouseKeys in the text box and then click the Display button. To answer each of the following questions, click an appropriate topic in the Topics Found dialog box, click the Display button, and read the Help information. To display a different topic, click the topic and then click the Display button.

- How do you turn on MouseKeys?
- How do you use MouseKeys to move the mouse pointer?
- How do you perform each of these operations using MouseKeys: click, right-click, double-click, drag?

Click the Close button to close the Help window.

Web Work

Student Exercises

Web Links

In Summary

Key Terms

Learn It Online

Checkpoint

In The Lab

Web Work

Special Features ■ TIMELINE 2002 ■ WWW & E-SKILLS ■ MULTIMEDIA ■ BUYER'S GUIDE 2002 ■ WIRELESS TECHNOLOGY ■ TRENDS 2002 ■ INTERACTIVE LABS ■ TECH NEWS

Web Instructions: To display this page from the Web, start your browser and enter the URL scs.site.com/dc2002/ch5/web.htm. To view At The Movies in exercise 1, RealPlayer must be installed on your computer (download by clicking [here](#)). To use the Shelly Cashman Series Scanning Documents Lab from the Web, Shockwave and Flash Player must be installed on your computer (download by clicking [here](#)).



Web Cam Virtual World

To view the Web Cam Virtual World movie, click the button to the left or click the Play button to the right. Watch the movie, and then complete the exercise by answering the questions below. The Internet is where the curious meet the pretentious. With the availability of mobile cameras, Web cams, and PC video cameras, images reach millions of people. From around the globe, you can watch gorillas from Namibia, the miracle of birth at a hospital, or a toddler's birthday party next door. Some of this Web cam virtual world is informative, some serves a useful purpose, some of it is just entertainment, and some of it is intrusive. A more open society sounds like a good thing, but what about the privacy issues? Are there limits to what should be on the Web, or only limits to who should have access? Is access to this virtual world too easy or distracting? Will it help or hinder efforts to solve the problems of the real world?



Shelly Cashman Series Scanning Documents Lab

Follow the appropriate instructions in Web Work 2 on page 1.47 to start and use the Shelly Cashman Series Scanning Documents Lab. If you are running from the Web, enter the URL, www.scsite.com/sclabs/menu.htm; or display the Web Work page (see instructions at the top of this page) and then click the button to the left.



Sending E-Mail

E-mail allows you to send messages anywhere in the world. Use the e-mail account you set up in Web Work 4 in Chapter 3 to send a message. Click the button to the left to display your e-mail service. Log in to your e-mail service and then follow the instructions for composing a message. The subject of the message should be input devices. Type the e-mail address of one of your classmates. In the message itself, type something your classmate should know about input devices, and then send the message. Next, follow the instructions to read and reply to any messages you have received. When you are finished, quit your e-mail service.



In the News

Input devices can enhance user productivity and increase the number of potential users. The U.S. Army recently discovered this by replacing the many buttons used to operate a tank's onboard computer with a joystick and just three buttons. To the Army's delight, tank-driver performance has improved, and even individuals who scored poorly on Army intelligence tests handled the tanks effectively. Click the button to the left and read a news article about a new or improved input device, an input device being used in a new way, or an input device being made more available. What is the device? Who is promoting it? How will it be used? Will the input device change the number, or effectiveness, of potential users? If so, why?

